NATIONAL LIBRARY OF SCOTLAND

22

[129*]

ROYAL OBSERVATORY, GREENWICH,

LONDON, S.E.

1882 . July .

SIR,

I HAVE the honor to inform you that the publication of the Royal Observatory, mentioned on the next leaf, presented to you

by authority of the Lords Commissioners of the Admiralty, has been forwarded by Post

*I request the favor of an acknowledgment of receipt.

I have the honor to be,

SIR,

Your very obedient Servant,

To

* Non-Compliance with this request will be interpreted as an intimation that similar works are not desired in future.

F & T 1000 12—79

Receipt acknowledged.
July 12. 1882

J F Campbell
Niddry Lodge
Kensington London W.

LVIII - Sunshine in hours
L.. - amount of [illegible]

Instrument invented 1853. & now with some alterations in general use by meteorologists in England; and at a great many stations abroad & in both hemispheres.

RESULTS

OF THE

MAGNETICAL AND METEOROLOGICAL OBSERVATIONS

MADE AT

THE ROYAL OBSERVATORY, GREENWICH,

IN THE YEAR

1880

UNDER THE DIRECTION OF

SIR GEORGE BIDDELL AIRY, K.C.B. M.A. LL.D. D.C.L.

EDITED BY

W. H. M. CHRISTIE, M.A., F.R.S.,

ASTRONOMER ROYAL.

PUBLISHED BY ORDER OF THE BOARD OF ADMIRALTY

IN OBEDIENCE TO HER MAJESTY'S COMMAND.

LONDON:
PRINTED BY GEORGE EDWARD EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

1882.

ERRATA.

GREENWICH MAGNETICAL AND METEOROLOGICAL OBSERVATIONS, 1879.

Page (lx), col. 12, *dele* −270.

Page (lxi), col. 4, *dele* −90; col. 12, *dele* $-67\frac{1}{2}$.

INDEX.

INDEX.

INDEX.

INDEX.

INDEX.

x 17

INDEX.

INDEX.

[6]

ROYAL OBSERVATORY, GREENWICH.

RESULTS

OF

MAGNETICAL AND METEOROLOGICAL OBSERVATIONS.

1880.

GREENWICH MAGNETICAL AND METEOROLOGICAL OBSERVATIONS, 1880.

Introduction.

The magnetical and meteorological observations contained in this Volume were made and partly reduced under the superintendence of Sir G. B. Airy, K.C.B., as Astronomer Royal, before his resignation of that office on 1881, August 15.

§ I. *Buildings of the Magnetic Observatory.*

In consequence of a representation by the Astronomer Royal, dated 1836, January 12, and a memorial by the Board of Visitors of the Royal Observatory, dated 1836, February 26, addressed to the Lords Commissioners of the Admiralty, an additional space of ground on the south-east side of the former boundary of the Observatory grounds was inclosed from Greenwich Park for the site of a Magnetic Observatory, in the summer of 1837. (This ground was in 1868 extended 100 feet to the south; but no building has been erected on the extension for purposes connected with magnetism or meteorology.) The Magnetic Observatory was erected in the spring of 1838. Its nearest angle in its present form is about 174 feet from the nearest point of the S.E. dome, and about 30 feet from the office of the Clerk of Works. It is based on concrete and built of wood, united for the most part by pegs of bamboo; no iron was intentionally admitted in its construction, or in subsequent alterations. Its form, as originally built, was that of a cross with four equal arms, very nearly in the direction of the cardinal magnetic points as they were in 1838; the length within the walls, from the extremity of one arm of the cross to the extremity of the opposite arm, was 40 feet, the breadth of each arm 12 feet. In the spring of 1862, the northern arm was extended 8 feet. The height of the walls inside is 10 feet, and the ceiling of the room is about 2 feet higher. The northern arm of the cross is separated from the central square by a partition, so as to form an ante-room, which is occupied by computers of the Magnetical and Meteorological Department. The meridional magnet for observations of absolute declination, formerly used also for observations of variations of declination, (placed in its position in 1838), is mounted in the southern arm; and the theodolite by which the magnet-collimator is viewed, and by which circumpolar stars for determination of the astronomical meridian are also observed, (for which observation an opening is made in the roof, with proper shutters) is in the southern arm, near the southern boundary of the central square. The bifilar magnet, for variations of horizontal magnetic force

(erected at the end of 1840), was mounted near the northern wall of the eastern-arm; and the balance-magnetometer, for variations of vertical magnetic force (erected in 1841) was mounted near the northern wall of the western arm. Important changes have subsequently been made in the positions of these instruments, as will be mentioned below. The sidereal-time-clock is in the south arm, near the south-east re-entering angle. The fire-grate (constructed of copper, as far as possible) is near the north end of the west side of the ante-room. Some of these fixtures may contain trifling quantities of iron; and, as the ante-room is used as a computing room, it is impossible to avoid the introduction of iron in small quantities; great care, however, is taken to avoid it as far as possible.

In 1864, a room, called the Magnetic Basement, was excavated below the whole of the Magnetic Observatory except the ante-room; the descent to it is by a staircase close to the south wall of the western arm of the building.

For the theodolite, a brick pier was built from the ground below the floor of the Basement, rising through the ceiling into the south arm of the upper room, and supporting the theodolite in exactly the same position as before.

Instead of a single meridional magnet performing the double functions of "magnet for determining absolute magnetic declination," and "magnet carrying a mirror for photographic register," there are now two meridional magnets, one in the Upper Room and one in the Basement. The upper (original) magnet is in a position about 10 inches north of its former position; it carries a collimator, for observation by the theodolite; but, in reversion of position of the collimator, the collimator is always either above or below the magnet, so that the magnet is always in the same vertical. The lower magnet, procured in the year 1864, is in nearly the same vertical with the upper magnet; it carries the mirror for the photographic register of the continual changes of declination. A massive brick pier is built in the south arm of the Basement, covered by a stone slab; upon it is fixed the gun-metal stand carrying the photographic lamp, and the slit through which it shines; from the stone slab rise three smaller piers, upon which crossed slates are placed; and from these rises a small pier through the ceiling, to the height of 18 inches above the upper floor, carrying the suspension pulleys of the lower magnet; the skein of silk, which supports the lower magnet, passes through a hole in one of the slates. Upon the slates on the brick piers rest the feet of the original wooden stand carrying the suspension of the upper magnet. As, from time to time, the wooden stand has been shifted slightly to the west, with change of the magnetic meridian, its western support had, in course of time, reached such a position that it became necessary in 1876 to place, on the top of the original slate, another slate, bound by brass cramps to the brick pier, but projecting further west. On this the support of the wooden stand now rests.

The bifilar-magnetometer is in the Basement, in a position vertically below its former position. A massive brick pier, surmounted by a thick slab of stone (upon

which the metal stand carrying the photographic lamp and slit is fixed) supports a pier consisting of a back and return-sides, which rises through the ceiling about 2 feet above the upper floor, and is crowned by a slate slab that carries the suspension of the bifilar-magnetometer, and also supports the electrometer.

The vertical-force magnetometer is in the Basement, in a position vertically below its former position; it rests upon a brick pier, capped by a thick stone; to which also is fixed the plate of metal with slit through which passes the light of the photographic lamp.

To the lower part of the theodolite-pier, within the Basement, are fixed telescopes for eye-observation of the bifilar and vertical-force magnetometers. They are protected from accidental violence by guards fixed to the floor, first attached on 1871, May 2.

At the south-east re-entering angle of the Basement (which has been rebated for the purpose) is the horizontal photographic cylinder, which receives the traces of the movements of the declination-magnet and the bifilar-magnet. The angle is so far cut away that the straight line joining their suspensions passes at the distance of one foot from the wall, and thus the cylinder receives the light from the concave mirrors carried by both instruments, at right angles to its surface. The vertical cylinder which receives the traces of the movements of the vertical-force-magnet, and of the self-registering barometer near it, is east of the vertical force pier.

In the south-east corner of the eastern arm is placed the apparatus for self-registration of the spontaneous galvanic currents on the wires leading respectively from Angerstein Wharf to Lady Well Station (on the Mid Kent Railway), and from North Kent Junction (on the Greenwich Railway) to the Morden College end of the Blackheath Tunnel (on the North Kent Railway). The straight lines connecting these points intersect each other nearly at right angles, at a point not far distant from the Observatory (see § 12 below).

The mean-time-clock is on the west wall of the south arm of the Basement.

Adjoining the north wall is the table for photographic operations. As much water is used in these operations, a pump, situated at the north-east corner of the north arm of the magnetic buildings, and distant about 30 feet from the nearest magnetometer, is therefore provided, by which the water is withdrawn from the cistern at the east end of the photographic table, and discharged into a covered drain.

Near the west end of the photographic table and fixed to the north wall is the Sidereal Standard Clock of the Astronomical Observatory, Dent 1906, communicating with the Chronograph and other clocks in the Astronomical Department by galvanic wires. It was established in this position at the end of May 1871.

The Basement is warmed by a gas-stove, and ventilated by a large copper tube nearly two feet in diameter, receiving the flues from the stove and all the lamps, and passing through the upper room to a revolving cowl above the roof. Each of the

arms of the basement has a window facing the south, but in general the window-wells are closely stopped.

The variations in the temperature of the instruments have been greatly reduced by their location within this Basement.

A platform, erected above the roof of the Magnetic Building, is used principally for observations of meteors. The sunshine-instrument is placed on a table on this platform.

The apparatus for naphthalizing the gas used in the photographic registration is mounted in a small detached zinc-built room, erected in 1863, near the west side of the ante-room. The use of the naphthalizing process, which had been discontinued in the years 1865 to 1870, has since 1871 been resumed.

In 1863, a range of seven rooms, usually called the Magnetic Offices, was erected near the southern fence of the grounds, as it existed after the addition made in 1837. Since the summer of 1863, observations of Dip and Deflexion have been made in the westernmost of these rooms, Office No. 7. The Watchman's Clock is placed in Office No. 1, and Offices Nos. 2, 3, and 4 are now used for photographic purposes in connection with the Photoheliograph placed in a dome adjoining Office No. 3 on the south side.

At the distance of 28 feet south (magnetic) from the south-east angle of the southern arm is an open shed about $10^{ft}\ 6^{in}$ square, supported by four posts at the height of 8 feet, with an adjustible opening at the center of the roof. Under this shed are placed the large dry-bulb and wet-bulb thermometers, with a photographic cylinder, whose axis is vertical, between them; and external to these are the gas flames, whose light passing through the thermometer-tubes above the quicksilver makes photographic traces upon the paper which covers the cylinder.

In October of the year 1879 the "Naylor" Equatoreal was mounted in the ground which had been added in 1868. On account of its proximity to the Dip and Deflexion instruments, from the latter of which it is distant about 35 feet in a nearly south-south-east (magnetic) direction, it was thought that the iron of the equatoreal might in some small degree influence the observations made with these instruments. The most delicate test of the existence of any appreciable effect appeared to be the observation of the time of vibration of the magnet used in the Deflexion experiments. On, however, collecting these observations for some months preceding and following the time of planting the Equatoreal in the position mentioned, no appreciable influence on the observed time of vibration could be detected.

For better understanding of these descriptions, the reader is referred to the Descriptions of Buildings and Grounds with accompanying Maps, attached to the Volumes of Astronomical Observations for the years 1845 and 1862.

§ 2. *Upper Declination-Magnet and Apparatus for observing it.*

The theodolite, with which the declination magnet is observed, is by Simms: the radius of its horizontal circle is 8·3 inches: it is divided to 5′; and is read to 5″, by three verniers, carried by the revolving frame of the theodolite. The fixed frame stands upon three foot-screws, which rest in brass channels let into the stone pier that stands upon the brick pier rising from the ground of the Magnetic Basement. The revolving frame carries the Y's (with vertical adjustment at one end) for a telescope with transit-axis: the length of the axis is 10½ inches: the length of the telescope 21 inches: the aperture of the object glass 2 inches. The Y's are not carried immediately by the T head which crosses the vertical axis of the revolving frame, but by pieces supported by the ends of that T head, and projecting horizontally from it: the use of this construction is to allow the telescope to be pointed sufficiently high to see δ Ursæ Minoris above the pole. The eye-piece of the telescope carries only one fixed horizontal wire, and one vertical wire moved by a micrometer-screw. The opening in the roof of the building permits the observation of circumpolar stars, as high as δ Ursæ Minoris above the pole, and as low as β Cephei below the pole.

For supporting the magnet, a braced wooden tripod-stand is provided, whose feet, as above described, rest upon slates covering brick piers in the Magnetic Basement. Upon the cross-bars of the stand rests a double rectangular box (one box completely inclosed within another), both boxes being covered with gilt paper on their exterior and interior sides, and having holes at their north and south ends for illumination of the collimator or reversed telescope carried by the magnet, and for viewing the collimator from the theodolite. The holes in the outer box are covered with glass. On the southern side of the principal upright piece of the stand is a moveable upright bar, turning in the vertical E. and W. plane, upon a pin in its center (which is fixed in the principal upright), and carrying at its top a brass frame supporting two pulleys for suspension of the magnet; this construction is adopted as convenient for giving an E. and W. movement (now very rarely required) to the point of suspension, by giving a motion to the lower end of the bar. The pulleys, whose axes are E. and W., project one on the north side of the moveable upright, the other on the south side, and are adapted to carry a flat leather strap. Formerly this strap was attached directly to the suspension skein, but at the beginning of the year 1877 this manner of attachment was changed. The end of the strap depending from the north pulley is now connected to a square wooden rod sliding in the corresponding squared hole of a fixed wooden bracket. The suspension skein is attached to the lower end of the wooden rod, so that in raising or lowering the magnet carrier (necessary in some operations) no alteration is made in the free length of the suspension skein. The strap passes from the north pulley over the

south pulley, and thence downwards to a small windlass, fixed to the lower part of the moveable upright. The height of the two pulleys above the floor is about 11 ft. 4 in., and the height of the magnet is about 2 ft. 11 in.; the length of the rod, carrying at its upper end the torsion circle, and at its lower end the cradle supporting the magnet, is 1 ft. 4 in.; and the length of strap and rod below the north pulley is about 1 ft. 3 in.; so that the length of the free suspending skein is about 5 feet 10 inches. On 1879, July 10, the cord connecting the leather strap with the small windlass gave way; a new cord was at once attached and the magnet remounted, the same suspension-skein being used.

The magnet was made by Meyerstein, of Göttingen: it is a bar 2 feet long, $1\frac{1}{2}$ inch broad, and about $\frac{1}{4}$ inch thick: it is of hard steel throughout. The magnet-carrier was also made by Meyerstein, but it has since been altered by Simms. The magnet is inserted sideways and fixed by a screw in the double square hook which constitutes the lower part of the magnet-carrier. This lower part turns stiffly on a vertical axis, independently of the upper part, and carries with it the graduated torsion circle: to the upper part is fixed the vernier for reading the circle. The upper part of the magnet-carrier is simply hooked into the skein.

The suspending skein is of silk fibre, in the state in which it is first prepared by silk manufacturers for further operations; namely, when several fibres from the cocoon are united by juxtaposition only (without twist) to form a single thread. The skein is strong enough to support perhaps three times the weight of the magnet, &c.

In the summer and autumn of 1864, an attempt was made to suspend the magnet by a steel wire, capable of supporting the weight 15 lbs.; but the torsion force was found to be so large as greatly to diminish the value of the observations; and the skein was restored on 1865, January 20. (A similar attempt was made for suspension of the lower magnet; the skein, however, was restored on 1865, January 30.)

The upper magnet carries two sliding brass frames, firmly fixed in their places by means of pinching-screws. One of these contains, between two plane glasses, a cross of delicate cobwebs; the other holds a lens of 13 inches focal length and nearly 2 inches aperture. This combination, therefore, serves as a reversed telescope without a tube: the cross of cobwebs is seen very well with the theodolite-telescope, when the suspension-bar of the magnet is so adjusted as to place the object-glass of the reversed telescope in front of the object-glass of the theodolite, their axes coinciding. The wires are illuminated by a lamp and lens at night, and by a reflector during the day.

In the original mounting of this magnet the small vibrations were annihilated by a copper oval or "damper," thus constructed: A copper bar, about one inch square, is bent into a long oval form, intended to encircle the magnet (the plane of the oval

curve being vertical). A lateral bend is made in the upper half of the oval, to avoid interference with the suspension-piece of the magnet. The effect of this damper is, that after every complete or double vibration of the magnet, the amplitude of the oscillation is reduced in the proportion of 5 : 2 nearly.

On mounting the photographic magnetometer in the basement, the damper was removed from its place surrounding the upper magnet, and was adjusted to encircle the photographic magnet. The upper magnet remained unchecked in its vibrations till 1866, January 23, when the lower part of its carrier was connected with a horizontal brass bar which vibrates in water.

OBSERVATIONS RELATING TO THE PERMANENT ADJUSTMENTS OF THE UPPER DECLINATION-MAGNET AND ITS THEODOLITE.

1. Determination of the inequality of the pivots of the theodolite-telescope.

1875, August 31. The theodolite was clamped, so that the transit-axis was at right angles to the meridian. The illuminated end of the axis of the telescope was first placed to the East: the level was applied, and its scale was read; the level was then reversed, and its scale was again read; it was then again reversed, and again read, and so on successively six times. The illuminated end of the axis was then placed to the West, and the level was applied and read as before. This process was repeated several times, and the result was, that when the level indicates the axis to be horizontal, the pivot at the illuminated end is really too low by 1″·5. Other determinations made 1875, September 21, and 1876, December 1, gave respectively 1″·3 and 1″·1. The value applied during the year 1880 to the mean level reading is 1^{div}·3 as before, equivalent to 1″·4.

2. Value of one revolution of the micrometer-screw of the theodolite-telescope.

On 1870, December 29, the magnet was made to rest on blocks of wood, and its collimator was used as a fixed mark at an infinite distance. The micrometer of the theodolite-telescope was placed at a definite reading, the telescope was turned until the micrometer-wire bisected the cross, and the circle was then read. The result of several comparisons of circle-readings corresponding to large values of micrometer-reading with circle-readings corresponding to small values of micrometer-reading was, that one revolution = 1′. 34″·2. Similar experiments made 1875, September 1 and December 28, gave respectively 1′. 34″·1, and 1′. 34″·2. The value used throughout the year 1880 is 1′. 34″·2.

3. Determination of the micrometer-reading for the line of collimation of the theodolite-telescope.

1879, December 9. The vertical axis of the theodolite had been adjusted to verticality, and the transit-axis was made horizontal. The declination-magnet was

made to rest on blocks, and the cross-wires carried by it were used as a collimator for determining the line of collimation of the telescope of the theodolite. The telescope was reversed after each observation. The mean of 15 double observations was $100^{r}\cdot202$. Other observations taken at different times during the year 1880 satisfactorily confirmed this value. The value $100^{r}\cdot202$ was used throughout the year.

4. Determination of the effect of the mean-time-clock on the declination-magnet.

The observations by which this has been determined are detailed in the volumes for 1840—1841, 1844, and 1845. It appeared that it was necessary to add $9''\cdot41$ to every reading of the theodolite. The clock was removed to the basement in 1864, having now nearly the same relative position to the lower declination-magnet which formerly it had to the upper. No correction is now applied.

5. Determination of the compound effect of the vertical-force-magnet and the horizontal-force-magnet on the declination-magnet.

The details applying to the combined effect of the horizontal-force-magnet and first vertical-force-magnet will be found in the volumes for 1840—1841, 1844, and 1845. It appeared that it was necessary to subtract $55''\cdot22$ from all readings of the theodolite. In 1848 a new vertical-force-magnet was introduced, and the subtractive quantity was then found to be $42''\cdot2$. A few experiments made on 1864, May 26, with the horizontal-force-magnet, and an old vertical-force-magnet in the new positions in the basement, seemed to show that the theodolite readings required a subtractive correction of $36''\cdot9$, but no numerical correction has since been applied. No experiments have been made since mounting the vertical-force-magnet now in use.

6. Determination of the error of collimation for the plane glass in front of the outer box of the declination-magnet.

1879, January 28. The magnet was made to rest on blocks. The micrometer head of the telescope was to the east. The plane glass has the word "top" engraved on it, and, in ordinary use, this word is always kept east. The cross-wire carried by the collimator of the magnet was observed with the engraved word alternately east and west. The result of 10 double observations was, that in the ordinary position of the glass $18''\cdot5$ is to be added to all readings. On 1879, December 9, further observations gave $19''\cdot1$. The value $18''\cdot8$ has been used throughout the year 1880.

7. Determination of the error of collimation of the magnet-collimator, with reference to the magnetic axis of the magnet.

1879, December 9. Observations were made by placing the declination-magnet in its stirrup, with its collimator alternately above and below, and observing the collimator-wire by the theodolite-telescope; the windlass of the suspending skein

being so moved that the collimator in each observation was in the line of the theodolite-telescope. The observation was repeated several times. The mean half excess of reading with collimator above (its usual position), over that with collimator below, was 26′. 2″·2. Observations made 1880, October 26, gave 25′. 56″·6. The mean of these values, or 25′. 59″·4, has been used during the year 1880.

8. Effect of the damper.

In the volume for 1840—1841 observations are exhibited showing that the oval copper bar, or damper, which then surrounded what is now the upper declination-magnet, had but little or no effect. Repeated observations, of less formal character, in succeeding years, have confirmed this result. The same bar has encircled the lower declination-magnet since the year 1864. The following observations were made in the year 1865, for ascertaining the effect of the damper on the lower declination-magnet under various circumstances.

On 1865, February 8 and 10, and March 2, the time of vibration of the magnet was observed :—

	s
Mean of times with damper in usual position	23 ·888
Mean of times with damper reversed end for end........................	24 ·508
Mean of times when damper was removed............................	23 ·153

These seem to indicate a repulsion of the magnet by the damper, but the magnet came to rest so rapidly that the observations are very uncertain.

On several days from 1865, April 2 to May 12, observations were made for ascertaining the deflection of the magnet produced by turning the damper through a small angle round a vertical axis, passing through its center.

DAMPER IN USUAL POSITION.

		′ ″
Damper turned through 2°	N. end towards E., increase of western declination	−1. 27
	N. end towards W., „ „ „	+1. 25
Damper turned through 4°	N. end towards E., „ „ „	−2. 16
	N. end towards W., „ „ „	+3. 11
Damper turned through 6°	N. end towards E., „ „ „	−3. 10
	N. end towards W., „ „ „	+2. 55
Damper turned through 8°	N. end towards E., „ „ „	−1. 22
	N. end towards W., „ „ „	+1. 45

DAMPER REVERSED END FOR END.

		′ ″
Damper turned through 2°	N. end towards E., increase of western declination	+0. 12
	N. end towards W., „ „ „	+0. 20
Damper turned through 4°	N. end towards E., „ „ „	0. 0
	N. end towards W., „ „ „	+0. 26
Damper turned through 6°	N. end towards E., „ „ „	+0. 5
	N. end towards W., „ „ „	+0. 5
Damper turned through 8°	N. end towards E., „ „ „	−0. 10
	N. end towards W., „ „ „	+0. 5

The first series shews clearly that the damper in its usual position drags the magnet; the second shews no certain effect. It seems that the damper possesses two kinds of magnetism, one permanent, the other transiently induced, of nearly equal magnitude; their sum being about $\frac{1}{100}$ part of the terrestrial effect for the same deflexion.

From 1865, July 25 to August 9, observations were made to ascertain whether the effect of an external deflecting cause is the same with the damper present and the damper removed. The observation was extremely difficult, as the magnet was perpetually in vibration when the damper was removed. A small magnet on the east side of the N. end of the magnetometer, with its north end pointing towards the East (and therefore diminishing the western declination of the magnetometer), was moved to the distance (about five feet) at which it produced a deviation of 5′ nearly. The apparent western declination was observed, damper present, and damper removed. It appeared to be less with damper present than with damper removed, by 0′. 53″. The separate results are very discordant. If the conclusion has any validity, it tends to show a repulsive power in the damper, opposite to that found in the preceding experiments. This experiment is regarded as inconclusive.

9. Calculation of the constant used throughout the year 1880 in the reduction of the observations of the upper declination-magnet, the micrometer-head of the theodolite-telescope being East.

Reading for line of collimation - - - - - -	100r·202
	° ′ ″
Micrometer equivalent - - - - - - -	−2. 37. 19·0
Correction for the plane glass in front of the outer box, in its usual position	+ 18·8
The collimator above the magnet. Correction for error of collimation -	− 25. 59·4
Constant to be used in the reduction of the observations - - -	−3. 2. 59·6

10. Determination of the time of vibration of the upper declination-magnet under the action of terrestrial magnetism.

On 1873, August 7, this was found to be 31s·40; on 1874, December 31, 31s·33; on 1875, December 31, 31s·25; on 1877, January 10, 31s·21; on 1879, January 28, 31s·22; on 1879, December 9, 31s·21; and on 1880, December 29, 30s·78.

11. Fraction expressing the proportion of the torsion-force to the earth's magnetic force.

By the same process which is described in the Magnetical Observations 1847, but with the system of suspension and silk skein at present in use, the proportion was

found, on 1877, January 10, $\frac{1}{155}$; on 1877, December 18, $\frac{1}{155}$; on 1879, January 28, $\frac{1}{155}$; and on 1879, December 9 (after disturbance of the suspension, see page *viii*), $\frac{1}{176}$.

DETERMINATION OF THE READINGS OF THE HORIZONTAL CIRCLE OF THE THEODOLITE CORRESPONDING TO THE ASTRONOMICAL MERIDIAN.

The reading of the circle corresponding to the astronomical meridian is determined by occasional observation of the stars Polaris and δ Ursæ Minoris generally at the time at which the observer attends in the evening for other duties. Six measures are usually taken on each night of observation.

For all observations made within one hour of the time of the star's meridian passage the azimuthal correction has been taken from a manuscript table having for arguments "Hour Angle" and "North Polar Distance." For hour angles greater than one hour the correction has been independently calculated.

The error of level is determined by application of the spirit-level at the time of observation: due regard being paid, in the reduction, to the inequality of pivots already found. One division of the level is considered = 1″·0526. The azimuth-reading is then corrected by the quantity :—

Correction = Elevation of W. end of axis × tan. star's altitude.

The readings of the azimuth circle increase as the instrument is turned from N. to E., S., and W.; from which it follows that (telescope pointing to North), the correction must have the same sign as the elevation of the W. end.

Observations for determining the reading corresponding to the astronomical meridian were made on the following days in 1880:—January 22; February 17; March 9, 29; April 20; May 13; June 11, 28; August 4, 31; September 27; October 18; November 8, 25; December 25. As a check on the continued steadiness of the theodolite, observations of a fixed mark (a small hole in a plate of metal above the Observatory Library) have been taken twenty-eight times at intervals through the year. The concluded mean reading for the south astronomical meridian used was, from January 1 to June 1, 27°. 5′. 25″·6; from June 2 to June 8, 27°. 5′. 30″·0; and from June 9 to December 31, 27°. 5′. 31″·3.

The following is a description of the method of making and reducing the eye-observations of the declination-magnet :—

A fine horizontal wire (as stated on page *vii*) is fixed in the field of view of the theodolite-telescope, and another fine vertical wire is fixed to a wire-plate, moved right and left by a micrometer screw. On looking into the telescope, the diagonally placed cross of the magnetometer is seen, and, during vibration of the magnet, will

be observed to pass alternately right and left. The observation is made by turning the micrometer till its wire bisects the image of the magnet-cross at the pre-arranged times, and reading the micrometer. Then the verniers of the horizontal circle are read.

The mean-time clock is kept very nearly to Greenwich mean time (its error being ascertained each day), and the clock-time for each determination is arranged before hand. Chronometer M'Cabe 649 has usually been employed for observation.

If the magnet be in a state of disturbance, the first observation is made by the observer applying his eye to the telescope about one minute before the pre-arranged time; he bisects the magnet-cross by the micrometer wire at 45^s, and again at 15^s before that time, also at 15^s and 45^s after that time. The intervals of these four observations are the same nearly as the time of vibration of the magnet (page *xii*), and the mean of all the times is the same as the pre-arranged time. The times of observation are usually $1^h. 5^m$, $3^h. 5^m$, $9^h. 5^m$, and $21^h. 5^m$ of Greenwich mean time.

The mean of each pair of adjacent readings of the micrometer is taken (giving three means), and the mean of these three is adopted as the result. In practice, this is done by adding the first and fourth readings to the double of the second and third, and dividing the sum by 6.

After removal of the copper damper from the upper to the lower declination-magnet in the year 1864, the upper magnet was usually in a state of vibration; but, since the introduction of the water-damper on 1866, January 23, the number of instances of excessive vibration has been very small. When it appears to be nearly free from vibration, two bisections only of the cross are made, one about 15^s before the time recorded, the other about 15^s after that time, and the mean adopted as result. (The lower magnet, encircled by the copper damper, never exhibits any troublesome vibrations.)

The adopted result is converted into arc, supposing $1^r = 1'. 34''{\cdot}2$, and the quantity thus deduced is added to the mean of the vernier-readings, to which is applied the constant given in article 9 of the permanent adjustments; the difference between this number and the adopted reading for the Astronomical South Meridian is taken; and thus is deduced the magnetic declination, which is used in determining the zero for the photographic register.

§ 3. *General principle of construction of Photographic self-registering Apparatus for continuous Record of Magnetic and other Indications.*

The general principle adopted for all the photographic instruments is the same. For the register of each indication, an accurately turned cylinder of ebonite is provided (excepting that for the electrometer, which is of brass). The axis of the

cylinder is placed parallel to the direction of the change of indication which is to be registered. If there are two indications whose movements are in the same direction, both may be registered on the same cylinder; thus, the Declination and the Horizontal Force, whose indications of changes of the respective elements travel horizontally, can both be registered upon one cylinder with axis horizontal; the same remark applies to the register of two different galvanic Earth-Currents; the Vertical Force and Barometer can both be registered upon one cylinder with axis vertical; and similarly the Dry-Bulb Thermometer and the Wet-Bulb Thermometer.

To the ends of each ebonite cylinder there are fixed circular brass plates, that which is near the clock-work having a diameter somewhat greater than that of the cylinder. In the further fittings there is a little difference between those for vertical and those for horizontal cylinders. Each horizontal cylinder has a pivot fixed in the brass plate at each end; these revolve each upon two antifriction wheels of the fixed frame. The vertical cylinders have no pivots; there is a perforation through the center of the lower or larger brass plate which, when the cylinder is mounted, is fitted upon a vertical spindle projecting upwards from the center of a second horizontal brass plate; this second brass plate sustains the weight of the vertical cylinder and turns horizontally, being supported by three antifriction wheels (each in a vertical plane) carried by the fixed frame.

Uniform rotatory motion is given to the cylinders by the action of clock or chronometer-work, regulated by either pendulum or duplex-escapement, or chronometer-escapement. For three of the cylinders the axis is placed opposite to the center of the chronometer, and a fork at the end of the hour hand takes hold of a winch fixed to the plate of the cylinder, or (in the vertical cylinders) to the plate that sustains the cylinder. In the cylinder for galvanic earth-currents, and in that of the electrometer, the connection is made by toothed wheels. For the horizontal cylinders, the plane of the chronometer work is vertical; for the vertical cylinders, it is horizontal.

The cylinders employed for the Declination and Horizontal Force registers, for the Vertical Force and Barometer registers, and for the Earth Current registers, are $11\frac{1}{2}$ inches high, and $14\frac{1}{4}$ inches in circumference; those for the thermometers are 10 inches high, and 19 inches in circumference; that for the electrometer is about $6\frac{1}{2}$ inches high and 19 inches in circumference.

Each cylinder, excepting that of the electrometer, is covered, when in use, by a tube of glass, which is open at one end, and has at the other end a circular plate of ebonite or brass, perforated at its center. The tube is a little larger than the cylinder; its open end is kept in position by a narrow collar of ebonite, and the opposite end by a circular piece of brass fixed to the smaller brass plate at the end of the cylinder.

To prepare the cylinder for register of indications, it is covered with a sheet of sensitised paper; the moisture on the paper usually causes the overlapping ends to adhere with sufficient firmness; the glass tube is then slipped over it, and the cylinder

thus prepared is placed (if horizontal) with its pivots in bearing upon its two sets of antifriction wheels, or, (if vertical) with its end-brass-plate upon the rotating brass plate, and its central perforation upon the spindle of that plate; care is taken to ensure connection with the clock-work, and the apparatus is ready for action.

The trace for each instrument is produced by a flame of coal gas charged with the vapour of coal naphtha. For the magnetometers the light shines through a small aperture about $0^{in}\cdot3$ long, and $0^{in}\cdot01$ broad; for the earth-current-apparatus, the barometer, and the electrometer, the aperture is larger. The arrangements for throwing on the photographic paper of the revolving cylinder a spot of light which shall travel in the direction of the cylinder's axis with every motion of either magnetometer or galvanometer, or with the rise and fall of the mercury in the barometer, are as follows.

For each of the three magnetometers, a large concave mirror of speculum metal is carried by a part of the magnet-carrier; although it has a small movement of adjustment relative to the magnet-carrier, yet in practice it is very firmly clamped to it, so that the mirror receives all the angular movements of the magnet. The lamp is placed slightly out of the direction of the straight line drawn from the center of the concave mirror to the center of the cylinder which carries the photographic paper. By the concave mirror, the light diverging from the aperture is made to converge to a place nearly on the surface of the cylinder carrying the photographic paper. The form of the aperture, however, and the astigmatism caused by the inclined reflexion from the mirror, produce this effect, that the image is somewhat elongated and is at the same time slightly curved. To diminish the length there is placed near the cylinder a system of plano-convex cylindrical lenses of glass, with their axes parallel to the axis of the cylinder, and the image is thus reduced to a neat spot of light.

In November of the year 1880 the cylindrical lenses used for the declination and horizontal force registers were superseded by two reflecting prisms of length equal to that of the cylinder, and placed side by side above it; one prism is directed towards the declination beam of light, the other towards the horizontal force beam, that face of each prism on which the light falls being curved to act as a cylindrical lens. The prisms are further so constructed that the two spots of light are brought to the same part of the circumference of the cylinder, (that is into a line parallel to the diameter of the cylinder, one spot towards one end of the cylinder, and one towards the other end,) instead of being on opposite sides of the cylinder as before. By this arrangement the time scale for both registers commences at the same part of the photographic sheet.

For the registers of galvanic earth-currents, the light, which falls upon a plane mirror carried by each galvanometer, is made to converge to a spot, by a system of cylindrical lenses.

For the barometer, the light, condensed by a vertically placed cylindrical lens, shines through a small horizontal slit in a plate of blackened mica (which moves with the fluctuations of the quicksilver), and thus forms a spot of light.

For the thermometers, the light shines through the vacant part of the tube, and thus forms a line of light.

For the electrometer, the light falling through a slit upon the small mirror carried by the needle support (§ 22), is thence reflected, and, by means of a plano-convex cylindrical lens brought to a small spot.

The spot of light (for the magnets, the earth-currents, the barometer, and the electrometer), or the boundary of the line of light (for the thermometers), moves, with the movements which are to be registered, in the direction of the axis of the cylinder, while the cylinder itself revolves. Consequently, when the paper is unwrapped from the cylinder, there is traced upon it (though not visible till the proper chemical agents have been applied) a curve, of which the abscissa measured in the direction of a line surrounding the cylinder is proportional to the time, while the ordinate measured in the direction parallel to the axis of the cylinder is proportional to the movement which is the subject of measure.

In the instruments for registering the motions of the magnets, the earth-currents, the barometer, and the electrometer, a line of abscissæ is actually traced on the paper, by a lamp giving a spot of light in an invariable position, the effect of which on the revolving paper is to trace a line surrounding the cylinder. For the thermometers this is not necessary, as the thermometer-scales are made to carry and to transfer to the photographic paper sufficient indications of the actual reading of the thermometers, by an apparatus which will be described in a following section (§ 16).

Every part of the cylinder apparatus for the magnets, for the earth-currents, and for the electrometer, is covered by cases of blackened zinc or wood, having slits for the moveable spots of light, and holes for the invariable spots; and all parts of the paths of the photographic light are protected as necessary by blackened zinc tubes from the admixture of extraneous light. The cylinder-apparatus for the thermometers is protected in the same manner, the whole, including the stems of the thermometers, and gaslights, being enclosed in a second zinc case, blackened internally.

In all the instruments, the following method is used for attaching, to the sheet of photographic paper, indications of the time when certain parts of the photographic trace were actually made, and for giving the means of aying down a time-scale applicable to every part of the trace. By means of a small moveable plate, arranged expressly for this purpose, the light which makes the trace can at any moment be completely cut off. An assistant, therefore, occasionally cuts off the light (registering in the proper book the clock-time of doing so), and after a few minutes withdraws the plate (again registering the time). The effect of this is to make visible interruptions in the trace, corresponding to registered times. By drawing

lines from these points of interruption parallel to the axis of the cylinder, to meet the photographic line of abscissæ, or an adopted line of abscissæ parallel to it, points are defined upon the line of abscissæ corresponding to the registered times. The whole length of the exposed part of the paper corresponds to the known time of revolution of the cylinder. A scale being prepared beforehand, whose value for the time of revolution corresponds in length to the circumference of the cylinder, the scale-readings for the registered times of interruption of light are applied to the ordinates corresponding to the interruptions, and the divisions of hours and minutes transferred at once from the scale to the line of abscissæ. In practice it is found that the length of the paper is not always the same, and it is necessary, therefore, to use for each instrument several pasteboard scales of different lengths, adapted to various lengths of the photographic sheets.

Since the year 1870, by means of an opening made in the chimneys of the registering lamps of the magnetometers, and in the chimneys of other lamps for the earth current galvanometers, the light at each instrument, when not interrupted, falls directly upon the cylindrical lens in front of the revolving cylinder, and, if allowed to act for a short time, produces, when the sheet is developed, a dark line upon the photographic paper. A clock, specially arranged by Messrs. E. Dent and Co., acting upon small shutters, uncovers simultaneously the chimney-openings in all the lamps about $2\frac{1}{2}$ minutes before each hour, and covers them simultaneously about $2\frac{1}{2}$ minutes after each hour. In this way a good series of hour-lines in the direction of the ordinates is formed. In December of the year 1880 the clock action was made, for the magnetic declination, horizontal force, and vertical force registers, to break the register itself at each hour (in the same way that the electrometer trace is broken by the electrometer clock) instead of photographing independent hour-lines. By these arrangements increased accuracy of the time-registers has been obtained, and the labour of the computers much diminished. The system of interrupting the trace by hand is still retained, as giving means of checking the clock indication. No automatic registration of hour-lines has yet been arranged for the Barometer or for the Dry-bulb and Wet-bulb Thermometers. For the electrometer, its driving-clock interrupts the register at each hour as explained in § 22.

§ 4. *Lower Declination-Magnet; and Photographic self-registering Apparatus for Continuous Record of Magnetic Declination.*

The lower declination-magnet is made by Simms. It is 2 feet long, $1\frac{1}{2}$ inch broad, $\frac{1}{4}$ inch thick, of hard steel throughout, much harder than the upper declination-magnet.

The magnet-frame consists of an upper piece, whose top is a hook (to be hooked into the suspension-skein), and which carries a concave mirror used for the photographic record in the manner described above. The lower part of this upper piece turns in a graduated horizontal circle, similar to the torsion circle of the upper magnet, and attached to the lower piece or magnet-carrier proper. The lowest part of the carrier is a double square hook, in which the magnet is inserted and is kept in position by the pressure of three screws.

It has been mentioned in § 1 that a small pier, built upon one of the crossed slates which are laid upon three piers rising from below, carries the suspension-pulleys. The suspension-skein rises to one of these pulleys, passes horizontally over a second pulley about 5 inches south of it, and then descends obliquely to a windlass which is fixed to the stone slab about 2 ft. 3 in. south of the center of the magnet.

The height of the pulley above the floor of the Basement is 10 ft. $4\frac{3}{4}$ in. As the height of the magnet above the floor is 2 ft. $10\frac{1}{2}$ in., and the length of the magnet frame is 1 ft. 3 in., there remains 6 ft. $3\frac{1}{4}$ in. of free suspending skein.

One of the revolving cylinders (§ 3) is used for the photographic record of the Declination-Magnet and the Horizontal-Force-Magnet. In the preparation of the basement in 1864, as has been stated, the south-eastern re-entering angle was cut away, so that the straight line from the suspending skein of the declination-magnet to the center of those of the bifilar magnet passes through a clear space, in which the registering apparatus is placed.

The concave mirror of the declination-magnet is 5 inches in diameter, and is above the top of the magnet-box. The distance of the light aperture from the mirror is about 25·3 inches. The bright spot formed by the reflection of light from the mirror is received on the revolving cylinder, near its western end.

For the declination-magnet, the values, in minutes and seconds of arc, of movements of the photographic spot in the direction of the ordinate, are thus deduced from a geometrical calculation founded on the measures of different parts of the apparatus. The distance of the cylinder from the concave mirror is 132·11 inches, and a movement of 1° of the mirror produces a movement of 2° in the reflected ray. From this it is found that 1° of movement of the mirror is represented by 4·611 inches upon the photographic paper. In the altered arrangement consequent on the introduction of the new reflecting prism (see page *xvi*) the distance is 134·4 inches, 1° of movement of the mirror being represented by 4·691 inches on the photographic paper. A small scale of paste-board is prepared, (for which a glass scale is in some operations substituted,) whose graduations correspond in value to minutes and seconds calculated on these units. The zero of the ordinate-scale is found in the following manner. The time-scale having been laid down as is already described, and actual observations of the position of the upper declination-magnet having been made with the eye and the telescope (as has been fully

described at page *xix*) at certain registered times, there is no difficulty (by means of these registered times) in defining the points of the photographic trace which correspond to the observed positions. The pasteboard scale being applied as an ordinate to one of these points, and being slid up and down till the scale reading which represents the reading actually taken by the eye-observation falls on that point, the reading of the scale where it crosses the line of abscissæ is immediately found. This process rests on the assumption that the movements of the upper and lower magnets are exactly similar. The various readings given by different observations, so long as there is no instrumental change, will scarcely differ, and may be combined in groups, and thus an adopted reading for the line of abscissæ may be obtained. From this, with the assistance of the same pasteboard scale, there can then be laid down without difficulty a new line, parallel to the line of abscissæ, whose ordinate would represent some whole number of degrees, or other convenient quantity.

§ 5. *Horizontal-Force-Magnet and Apparatus for observing it.*

The horizontal-force-magnet, furnished by Meyerstein of Göttingen, is, like the two declination-magnets, 2 feet long, $1\frac{1}{2}$ inch broad, and about $\frac{1}{4}$ inch thick. For its support (as is mentioned at page *ix*), a brick pier in the eastern arm of the Magnetic Observatory, built on the ground below the basement floor, rises through the floor of the upper room, and carries a slate slab, to the top of which a brass frame is attached, carrying two brass pulleys (with their axes in the same east and west line) in front of the pier, and two (in a similar position) at the back of the pier; these constitute the upper suspension-piece. A small windlass is attached to the back of the pier at a convenient height. The magnet-carrier consists of two parts. The upper part is a horizontal bar, $2\frac{1}{2}$ inches long, whose ends are furnished with verniers for reading the graduations of the torsion-circle (a portion of the lower part, to be mentioned below). On the upper side of this horizontal bar are two small pulleys with axes horizontal and at right angles to the vertical plane passing through the length of the bar: by these pulleys the apparatus is suspended, as will be mentioned. From the lower side of the horizontal bar, a vertical axis projects downwards through the center of the torsion-circle, in which it turns by stiff friction. The lower part of the magnet-carrier consists, first of the torsion-circle, a graduated circle about 3 inches in diameter: next, immediately below the central part of the torsion-circle, is attached (but not firmly fixed) a circular piece of metal from which projects downwards a frame that, by means of three cramps and screws, carries the photographic concave mirror, with the plane of its front under the center of the vertical axis: this circular piece of metal has a radial arm upon which acts a screw carried by the

torsion-circle, for giving to the concave mirror small changes of azimuthal position. Thirdly, there is fixed to the torsion-circle, at the back of the mirror-frame but not touching it, a bar projecting downwards, bent horizontally under the mirror-frame and then again bent downwards, carrying the cramps in which the magnet rests; and, still lower, a small plane mirror, to which a fixed telescope is directed for observing by reflexion the graduations of a fixed scale (to be mentioned shortly). Under the two small pulleys mentioned above passes a skein of silk; its two branches rise up and pass over the front pulleys of the suspension-piece, then over its back pulleys, and then descend and pass under a single large pulley, whose axis is attached to a wire that passes down to the windlass. Supported by the two branches of the skein, the magnet swings freely, but the direction that it takes will depend on the angular position of its stirrup with respect to the upper horizontal bar; it is intended that the index should be brought to such a position on the torsion-circle that the two suspending branches should not hang in one plane, but should be so twisted that their torsion-force will maintain the magnet in a direction very nearly E. and W. magnetic (its marked end being W.); in which state an increase of the earth's magnetic force draws the marked end towards the N., till the torsion-force is sufficiently increased to resist it; or a diminution allows the torsion-force to draw it towards the S. The magnet, with its plane mirror, hangs within a double rectangular box (one box completely inclosed within another) covered with gilt paper, similar to that used for the declination-magnet; in its south side there is one long hole, covered with glass, through which the rays of light from the scale enter to fall on the plane mirror, and the rays reflected by the mirror pass to the fixed telescope. The vertical rod (below the torsion-circle), which carries the magnet-stirrup, passes through a hole in the top of the box. Above the magnet box is the concave mirror above mentioned. The height of the brass pulleys of the suspension-piece above the floor is $11^{\text{ft.}}\ 8^{\text{in.}}\cdot 5$; that of the pulleys of the magnet-carrier is $4^{\text{ft.}}\ 2^{\text{in}}\cdot 5$; and that of the center of the plane mirror is about $3^{\text{ft.}}\ 1^{\text{in.}}$. The distance between the branches of the silk skein, where they pass over the upper pulleys, is $1^{\text{in.}}\cdot 14$; at the lower pulleys the distance between them is $0^{\text{in.}}\cdot 80$.

An oval copper bar (exactly similar to that for the declination-magnet), embraces the magnet, for the purpose of diminishing its vibrations.

The horizontal opal glass scale, which is observed by means of the plane mirror, is fixed to the south wall of the east arm of the Magnetic Basement. The numbers of the scale increase from East to West, so that when the magnet is inserted in the magnet-cell with its marked end towards the West, increasing readings of the scale (as seen with a fixed telescope directed to the mirror which the magnet carries) denote an increasing horizontal force. A normal to the scale from the center of the plane-mirror meets the scale at the division 51 nearly; the distance from the center of the plane-mirror to division 51 of the scale is 90·8 inches.

The telescope is fixed on the east side of the brick pier which supports the stone pier of the declination-theodolite in the upper observing room. The angle between the normal to the scale (which coincides nearly with the normal to the axis of the magnet) and the axis of the telescope, is about 38°, and the plane of the mirror is therefore inclined to the axis of the magnet about 19°.

OBSERVATIONS RELATING TO THE PERMANENT ADJUSTMENTS OF THE HORIZONTAL-FORCE-MAGNET.

1. Determination of the times of vibration and of the different readings of the scale for different readings of the torsion-circle, and of the reading of the torsion-circle and the time of vibration when the magnet is transverse to the magnetic meridian.

To render the process intelligible, it may be convenient to premise the following explanation.

Suppose that the magnet is suspended in its stirrup which is firmly connected with the small plane mirror, with its marked end in a magnetic westerly direction (not exactly west, but in any westerly direction between north and south), and suppose that, by means of the telescope directed towards that mirror, the scale is read, or (which is the same thing) the position of the plane mirror and of the stirrup, and therefore that of the axis of the magnet, is defined. Now let the magnet be taken out of the stirrup and replaced with its marked end easterly. The terrestrial magnetic power will now act as regards torsion, in the direction opposite to that in which it acted before, and the magnet will therefore take up a different position. But by turning the torsion-circle, which changes the amount and direction of the torsion-power produced by the oblique tension of the suspending cords, the magnet may be made to take the same position, but with reversed direction of poles, as at first (which will be proved by the reading of the scale, as viewed in the plane mirror, being the same). The reading of the torsion-circle will now be different from what it was at first. The effect of this operation then is, to give us the difference of torsion-circle-readings for the same position of the magnet-axis with the marked end opposite ways, but it gives no information as to whether the magnet-axis is accurately transverse to the meridian, inasmuch as the same operation can be performed whether the magnet-axis is transverse or not.

But there is another observation which will inform us whether the magnet-axis is or is not accurately transverse. Let the time of vibration be taken in each position of the magnet. Resolve the terrestrial magnetic force acting on the poles of the magnet into two parts, one transverse to the magnet, the other longitudinal. In the two positions of the magnet (marked end westerly and marked end easterly, with

axis in the same position), the magnitude of the transversal force is the same, and the changes which the torsion undergoes in a vibration of given extent are the same, and the time of vibration (if there were no other force) would be the same. But there is another force, namely, the longitudinal force; and when the marked end is northerly, this tends from the center of the magnet's length, and when it is southerly it tends towards the center of the magnet's length; and in a vibration of given extent this produces force, in one case increasing that due to the torsion and in the other case diminishing it. The times of vibration therefore will be different. There is only one exception to this, which is when the magnet-axis is transverse to the magnetic meridian, in which case the longitudinal force vanishes.

The criterion then of the position truly transverse to the meridian (which position is necessary in order that the indications of our instrument may apply truly to changes of the magnitude of terrestrial magnetic force without regard to changes of direction) is this. Find the readings of the torsion-circle which, with magnet in reversed positions, will give the same readings of the scale as viewed by reflexion in the plane mirror, and will also give the same time of vibration for the magnet. With these readings of the torsion-circle the magnet is transverse to the meridian; and the difference of the readings of the torsion-circle is the difference between the position when terrestrial magnetism acting on the magnet twists it one way, and the position when the same force twists it the opposite way, and is therefore double the angle due to the torsion-force of the suspending lines when they neutralize the force of terrestrial magnetism.

On 1879, January 2, some frayed parts of the suspension-skein were removed. The magnet was then remounted, and the following observations made:—

1879. Day.	The Marked end of the Magnet. West. Torsion-Circle Reading.	Scale Reading.	Difference of Scale Readings for 1° of Torsion.	Mean of the Times of Vibration.	East. Torsion-Circle Reading.	Scale Reading.	Difference of Scale Readings for 1° of Torsion.	Mean of the Times of Vibration.
	°	div.	div.	s	°	div.	div.	s
Jan. 2	145	41·82		..	228	43·44		20·52
	146	49·75	7·93	20·72	229	52·16	8·72	20·68
	147	58·12	8·37	20·60	230	59·65	7·49	20·82

The times of vibration and scale readings were sensibly the same, when the torsion-circle read 146°. 18′, marked end West, and 229°. 0′, marked end East, differing 82°. 42′. Half this difference, or 41°. 21′, is the angle of torsion when the

magnet is transverse to the meridian. The value deduced from the whole of the observations above was 41°. 23′·2. On 1879, June 7, the cord sustaining the suspension-skein gave way. A new cord was attached on June 9, and the magnet remounted. On July 17 another set of observations for determination of the angle of torsion gave 41°. 20′·0, and further sets made 1880, January 2, and December 30, gave 41°. 22′·0 and 41°. 25′·3 respectively.

The value adopted in the reduction of observations throughout the year 1880 was 41°. 22′·0.

The reading adopted for the torsion-circle, marked end of magnet west, was 146°. 0′ throughout the year.

2. Computation of the angle corresponding to one division of the scale, and of the variation of the horizontal force (in terms of the whole horizontal force) which moves the magnet through a space corresponding to one division of the scale.

It was found by accurate measurements, on 1864, November 3, that the distance from $51^{\text{div.}}$ on the scale to the center of the face of the plane mirror is 90·838 inches, and that the length of $30^{\text{div.}}$·85 of the scale is exactly 12 inches; consequently the angle at the mirror subtended by one division of the scale is 14′. 43″·25, or, for change of one division of scale-reading, the magnet is turned through an arc of 7′. 21″·625.

The variation of horizontal force (in terms of the whole horizontal force) for a disturbance through one division of the scale, is computed by the formula, "Cotan. angle of torsion × value of one division in terms of radius." Using the numbers above given, the value is found to be 0·002431, which has been used throughout the year 1880.

3. Determination of the compound effect of the vertical-force-magnet and the declination-magnet on the horizontal-force-magnet, when suspended with its marked end towards the West.

The details of the experiments, made while the old vertical-force-magnet was in use, will be found in the several volumes for 1840—1841, 1844, and 1845. The effect was to increase the readings by 0^{d}·487. On mounting a new vertical-force-magnet in 1848, similar experiments were made, and the resulting number was 0^{d}·45. These quantities are totally unimportant in their influence on the registers of changes of horizontal force. No experiments have been made since the magnets were placed in the basement.

4. Effect of the damper.

In the year 1865, from May 17 to May 25, observations were made for ascertaining the deflection of the magnet produced by turning the damper through a small angle round a vertical axis passing through its center.

DAMPER IN USUAL POSITION.

		div.
Damper turned through 2°	W. end towards S., increase of scale-reading	−0·251
	W. end towards N., ,, ,, ...	+0·050
Damper turned through 4°	W. end towards S., ,, ,, ...	−0·34
	W. end towards N., ,, ,, ...	+0·16

DAMPER REVERSED END FOR END.

		div.
Damper turned through 2°	W. end towards S., increase of scale-reading	−0·15
	W. end towards N., ,, ,, ...	−0·02
Damper turned through 4°	W. end towards S., ,, ,, ...	−0·12
	W. end towards N., ,, ,, ...	+0·08

On 1865, July 25, observations were made to ascertain whether the effect of an external deflecting cause is the same with the damper present and the damper removed. A small magnet was placed with its marked end pointing north at the distance 4 feet south of the unmarked end of the horizontal-force-magnet, deflecting the magnet through $1^{div.}$ of the scale, and the scale-readings were observed with the damper in its usual place and with the damper away. Three experiments were made, containing twenty-four observations of position. Not the smallest difference of position of the horizontal-force-magnet was produced by the presence or absence of the damper. The observations were very easy, and the result is certain.

No experiments on the damper have been made since 1865.

5. Temperature-correction of the horizontal-force-magnet.

In the Introduction to the Magnetical and Meteorological Observations for the year 1879, as well as in those for many previous years, will be found a detailed account of operations undertaken at different times for determination of the temperature correction of the horizontal and vertical force magnets. In one method the magnet was inclosed in a copper trough, placing therein water of different temperatures, and observing the difference of deflexion produced upon another magnet; in other experiments, instead of using water, the air within a copper box containing the magnet was artificially heated. In a third method the atmosphere of the whole room in which the magnet is situated (the magnetic basement) was artificially heated to different temperatures, and the change of position of the magnet as mounted for observation actually observed. It is to be remarked that results thus obtained include the entire effects of temperature upon all the various parts of the mounting of the magnet as well as on the magnet itself. Referring to previous volumes for details it is sufficient here to state that from a series of experiments made in the early part of the year 1868, on the principle last described, it appeared that when the marked end of the horizontal force magnet was to the west (its ordinary position) a change of 1° of temperature (Fahrenheit) produced a change of ·000174 of the whole horizontal force: a smaller number of observations

made with the marked end of the magnet east indicated that a change of 1° of temperature produced a change of ·000187 of horizontal force; increase of temperature in both cases being accompanied by decrease of magnetic force.

The method of observing with the horizontal-force-magnet is the following:—

A fine vertical wire is fixed in the field of view of the telescope, which is directed to the plane mirror carried by the magnet. On looking into the telescope, the graduations of the fixed scale, mentioned in page *xxi*, are seen; and during the oscillations of the magnet, the divisions of the scale are seen to pass alternately right and left across the wire. The clock-time, for which the position of the magnet is to be determined, is 5 minutes earlier than that for the observation of declination. The first observation is made by the observer applying his eye to the telescope 40^s (or about two vibrations) before the arranged time, and, if the magnet is in a state of vibration, he observes the next four extreme points of vibration on the scale, and the mean of these is adopted in the same manner as for the declination-observations; but if it appears to be at rest, then at 10^s before the pre-arranged time, he notes the reading of the scale; and 10^s after the pre-arranged time he notes whether the reading continues the same, and if it does, that reading is adopted as the result. If there is a slight difference in the readings, the mean is taken. The times of observation are usually 1^h, 3^h, 9^h, and 21^h of Greenwich mean time.

The number of instances when the magnet was observed in a state of vibration during the year 1880 is very small.

A thermometer, the stem and bulb of which reach considerably below the attached scale, is so planted in a nearly upright position on the outer magnet box, that the bulb projects into the interior of the inner box, that actually contains the magnet. Readings of this thermometer are usually taken at 0^h, 1^h, 2^h, 3^h, 9^h, 21^h, 22^h, and 23^h. Its index error is insignificant. Self-registering maximum and minimum thermometers placed outside the box were formerly read twice every day, but in consequence of the very small diurnal range of temperature, these observations have not been continued.

§ 6. *Photographic self-registering Apparatus for Continuous Record of Magnetic Horizontal Force.*

Referring to the general description of photographic apparatus, the following remarks apply more particularly to that which is attached to the horizontal-force-magnet. A concave mirror of speculum-metal, 4 inches in diameter, is carried by the magnet-carrier. The light of a gas-lamp shines through a small aperture about $0^{in}{\cdot}3$ high, and $0^{in}{\cdot}01$ broad (which is supported by the solid base of the brick pier

carrying the magnet-support), at the distance of about 21·25 inches from the concave mirror, and is made to converge to a point near the east end of the same revolving cylinder which receives the light from the concave mirror of the declination-magnet. The motions of this spot parallel to the axis represent the angular movements of the magnet which are produced by an increase of terrestrial magnetic force overcoming the torsion-force of the bifilar suspension, or by a diminution of terrestrial force yielding to the torsion-force.

The following is the calculation by which the scale of horizontal force on the photographic sheet is determined. The distance between the surface of the concave mirror and the surface of the cylinder is 134·436 inches; consequently, one degree of angular motion of the magnet, producing two degrees of angular motion of the reflected ray, moves the spot of light through 4·6927 inches. For the year 1880 the adopted value of variation of horizontal force for one degree of angular motion of the magnet = sin. 1° × cotan. 41°. 22′·0 = 0·019821; and the movement of the spot of light for 0·01 of the whole horizontal force is 2·368 inches. In the altered arrangement consequent on the introduction of the new reflecting prism (see page *xvi*) the distance is 136·8 inches, and the corresponding movement of the spot of light for 0·01 of the whole horizontal force 2·409 inches. With these fundamental numbers the graduations of the pasteboard scales for measure of horizontal force have been prepared. A new base-line for some convenient value of horizontal force is then laid down on each sheet in the same way as is described for the element of declination.

§ 7. *Vertical-Force-Magnet, and Apparatus for observing it.*

The vertical-force-magnet in use to 1848 was made by Robinson; that in use from 1848 to 1864 January 20 was by Barrow. The magnet now in use is by Simms. Its length is 1ft. 6in.; it is pointed at the ends. After some trials, it was re-magnetized by Mr. Simms on 1864, June 15. Between 1864, August 27, and September 27, a new knife-edge was attached to it, to remedy a defect which, as was afterwards found, arose from a cause that had no relation to the knife-edge. Its supporting frame rests upon a solid pier, built of brick and capped with a thick block of Portland stone, in the western arm of the magnetic basement. Its position is as nearly as possible symmetrical with that of the horizontal-force-magnet in the eastern arm. Upon the stone block is fixed the supporting frame, consisting of two pillars (connected at their bases) on whose tops are the agate planes upon which vibrate the extreme parts of the knife-edge (to be mentioned immediately). The carrier of the magnet is an iron frame, to which is attached, by clamps and pinching screws, a steel knife-edge, about 8 inches long. The steel knife-edge passes through

d 2

an aperture in the magnet. The axis of the magnet is as nearly as possible transverse to the meridian, its marked end being east. The axis of vibration is as nearly as possible north and south. To the southern end of the iron frame, and projecting further south than the end of the knife-edge, is fixed a small plane mirror, whose plane makes with the axis of the magnet an angle of $52\frac{3}{4}°$ nearly. The fixed telescope (to be mentioned) is directed to this mirror, and by reflexion at the surface of the mirror it views a vertical scale (to be mentioned shortly). The height of this mirror above the floor is about $2^{ft.}\ 10^{in.}\cdot 6$. Before the introduction of the photographic methods, the magnet was placed in a perforation of a brass frame midway between its knife-edges. But since the photographic method was introduced, the magnet has been placed excentrically; the distance of its southern face from the nearest end of the southern knife-edge being nearly 2 inches, and a space of $4\frac{1}{2}$ inches in the northern part of the iron frame being left disposable. In this disposable space there is attached to the iron frame by three clips a concave mirror of speculum-metal, with its face at right angles to the length of the magnet; it is used in the photographic system (shortly to be described). Near the north end of the iron frame are fixed in it two screw-stalks, upon which are adjustible screw-weights; one stalk is horizontal, and the movement of its weight affects the position of equilibrium of the magnet (which depends on the equilibrium between the moments of the vertical force of terrestrial magnetism on the one hand and of the magnet's center of gravity on the other hand); the other stalk is vertical, and the movement of its weight affects the delicacy of the balance, and varies the magnitude of its change of position produced by a change in the vertical force of terrestrial magnetism.

The whole is inclosed in a rectangular box. This box is based upon the stone block above mentioned; and in it the magnet vibrates freely in the vertical plane. In the south side of the box is a hole covered by glass, through which pass the rays of light from the scale to the plane mirror, and through which they are reflected from the plane mirror to the telescope. And at the east end is a large hole covered by glass, through which passes the light from the lamp to the concave mirror, and through which it is reflected to the photographic cylinder (to be described hereafter).

The telescope is fixed to the west side of the brick pier which supports the stone pier in the upper room carrying the declination-theodolite. Its position is symmetrical with that of the telescope by which the horizontal-force-magnet is observed; so that a person seated in a convenient position can, by an easy motion of the head left and right, observe the vertical-force and horizontal-force-magnets.

The vertical opal glass scale is fixed to the pier which carries the telescope, and is at a very small distance from the object-glass of the telescope. The wire in the field of view of the telescope is horizontal. The telescope being directed towards the mirror, the observer sees in it the reflected divisions of the scale passing upwards and

downwards over the fixed wire as the magnet vibrates. The numbers of the scale increase from top to bottom; so that, when the magnet is placed with its marked end towards the East, increasing readings (as seen with the fixed telescope) denote an increasing vertical force.

OBSERVATIONS RELATING TO THE PERMANENT ADJUSTMENTS OF THE VERTICAL-FORCE-MAGNET.

1. Determination of the compound effect of the declination-magnet, and horizontal-force-magnet, and of the iron affixed to the electrometer pole, on the vertical-force-magnet.

The experiments applying to the combined effect of the two magnets are given in the volumes for 1840–1841, 1844, and 1845: and those applying to the electrometer pole in the volume for 1842. It appeared that no sensible disturbance was produced on the magnet formerly in use. No experiments have been made with the new magnet. The electrometer-pole was removed in 1879, June.

2. Determination of the time of vibration of the vertical-force-magnet in the vertical plane.

In the year 1880, vibrations of the vertical-force-magnet were observed on 63 different days, and with readings of various divisions of the scale. The mean time of vibration adopted was $14^s{\cdot}202$ throughout the year.

3. Determination of the time of vibration of the vertical-force-magnet in the horizontal plane.

1879, December 31. The magnet with all its apparatus was suspended from a tripod in Magnetic Office, No. 6, its broad side being in a plane parallel to the horizon; therefore, its moment of inertia was the same as when it is in observation. A telescope, with a wire in its focus, was directed to the reflector carried by the magnet. A scale of numbers was placed on the floor of the room, at right angles to the long axis of the magnet, or parallel to the mirror. The magnet was observed only at times when it was swinging through a small arc. From 500 vibrations, the mean time of one vibration $=17^s{\cdot}255$. This number is used through the year 1880.

4. Computation of the angle through which the magnet moves for a change of one division of the scale; and calculation of the disturbing force producing a movement through one division, in terms of the whole vertical force.

The distance from the scale to the mirror is 186·07 inches, and each division of the scale $=\frac{12}{30{\cdot}85}$ inches. Hence the angle which one division subtends, as seen from the mirror, is $7'.\ 11''{\cdot}19$; and therefore the angular movement of the normal to the mirror, corresponding to a change of one division of the scale, is half this quantity, or $3'.\ 35''{\cdot}60$.

But the angular movement of the normal to the mirror is not the same as the angular movement of the magnet; but is less in the proportion of unity to the cosine of the angle which the normal to the mirror makes with the magnet, or in the proportion of unity to the sine of the angle which the plane of the mirror makes with the magnet. This angle has been found to be $52\frac{3}{4}°$; therefore, dividing the result just obtained by sine $52\frac{3}{4}°$, we have, for the angular motion of the magnet corresponding to a change of one division of the scale, 4'. 30''·85.

From this, the value, in terms of the whole vertical force, of the disturbing force, producing a change of one division, is to be computed by the formula, "Value of one division in terms of radius × cotan. dip × $\frac{T'^2}{T^2}$"; where T' is the time of vibration in the horizontal plane, and T the time of vibration in the vertical plane.

For the year 1879, T' was assumed = 17s·255, T = 14s·202, adopted value of dip = 67°. $35\frac{1}{2}$'. From these numbers, the change of vertical force, in terms of the whole vertical force, corresponding to one division of the scale, is found = 0·000799.

5. Temperature-correction of the vertical-force-magnet.

For detailed information in regard to the temperature correction of the new, or Simms, vertical-force-magnet, reference may be made to the Introduction for the year 1879 or to those of previous years. It is only necessary here to give the result of a series of experiments made in the early part of the year 1868, in which the atmosphere of the magnetic basement was itself heated to different temperatures, and the actual change of position of the magnet observed. It appeared from the observations at this time made that an increase of 1° of temperature (Fahrenheit) produced an increase of 0·000880 of the whole vertical force. The change produced by temperature thus found is very much greater than any given by previous experiments. Yet there would appear to be no doubt of its accuracy. And it is easy to see that an instrument, subjected to the effects of gravity working differentially on its two ends, is liable to great changes depending on temperature which have no connection with magnetism. For instance, if the point, at which the magnet is grasped by its carrier, is not absolutely coincident with its center of gravity, a sensible change in the space intervening between the grasping point and the center of gravity may be produced by a small change of temperature, and a disturbance of equilibrium and a great change of apparent magnetic position will follow. There appears to be no way of avoiding these evils but by maintaining almost uniform temperature, especially as regards its diurnal inequality; a condition which has been almost perfectly preserved in the year 1880.

The method of observing with the vertical-force-magnet is the following:—

A fine horizontal wire is fixed in the field of view of the telescope, which is directed to the small plane mirror carried by the magnet. On looking into the

telescope, the graduations of the fixed vertical scale are seen; and during the oscillations of the magnet, the divisions of the scale are seen to pass alternately upwards and downwards across the wire. The clock-time, for which the position of the magnet is to be determined, is the same as that for the horizontal force magnet. The observer applies his eye to the telescope about two vibrations before the arranged time, and if the magnet is in motion he observes its place at the next four extreme points of vibration; and the mean of these is taken as for the declination-magnet. But if the magnet is apparently at rest, then at one half-time of vibration before the arranged time, and at an equal interval after the arranged time, the reading of the scale is noted; if the reading continues the same that reading is adopted, if there is a slight difference, the mean is taken. The times of observation are usually 1^h, 3^h, 9^h, and 21^h of Greenwich mean time.

The number of instances in 1880 in which the magnet was found in a state of vibration is very small.

A thermometer, the stem and bulb of which reach considerably below the attached scale, is so planted in a nearly upright position on the magnet box, that the bulb projects into the interior of the box. Readings of this thermometer are usually taken at 0^h, 1^h, 2^h, 3^h, 9^h, 21^h, 22^h, and 23^h. Its index error is insignificant. Self-registering maximum and minimum thermometers were formerly read twice daily, but in consequence of the very small diurnal range of temperature these observations have not been continued.

§ 8. *Photographic self-registering Apparatus for Continuous Record of Magnetic Vertical Force.*

The concave mirror which is carried by the vertical-force-magnet is 4 inches in diameter; its mounting has been described in the last article. At the distance of about 22 inches from that mirror, and external to the box, is the horizontal aperture, about $0^{in}{\cdot}3$ in length and $0^{in}{\cdot}01$ in breadth, carried by the same stone block which carries the supports of the agate planes. The lamp which shines through this aperture is carried by a wooden stand. The light reflected from the mirror passes through a cylindrical lens with its axis vertical, very near to the cylinder carrying the photographic paper, and finally forms a well-defined spot of light on the cylinder of paper, at the distance of 100·18 inches from the mirror. As the movements of the magnet are vertical, the axis of the cylinder is vertical. The cylinder is about $14\frac{1}{4}$ inches in circumference, being of the same dimensions as those used for the declination and horizontal-force magnets, and for the earth-currents. The forms of the exterior and interior cylinders, and the method of mounting the paper, are in all respects the same as for the declination and horizontal-force magnets; but the

cylinder is supported by being merely planted upon a circular horizontal plate (its position being defined by fitting a central hole in the metallic cap of the cylinder upon a central pin in the plate), which rests on anti-friction rollers and is made by chronometer-work to revolve once in twenty-four hours. The trace of the vertical-force-magnet is on the west side of the cylinder.

On the east side, the cylinder receives the trace produced by the barometer (to be described hereafter). A pencil of light from the lamp which is used for the barometer shines through a fixed aperture; and by a system of prisms and a small cylindrical lens, a photographic base-line is traced upon the cylinder of paper, similar to that on the cylinder of the declination and horizontal-force magnets.

The scale for the ordinates of the photographic curve of vertical force is thus computed. Remarking that the radius which determines the range of the motion of the spot of light is double the distance 100·18 inches, and is therefore = 200·36 inches, the formula used in the last section, when applied to $\frac{\text{disturbing force}}{\text{whole vertical force}} = 0{\cdot}01$, gives value of division $= 200{\cdot}36 \times \tan.\ \text{dip} \times \left(\frac{T}{T'}\right)^2 \times 0{\cdot}01$. Using the values of T, T′, and of dip, given on page *xxx*, the value of the ordinate of the photographic curve for $\frac{\text{disturbing force}}{\text{whole vertical force}} = 0{\cdot}01$, thus obtained, is, for the year 1880, 3·292 inches. With this value, the pasteboard scale, used for measuring the photographic ordinates, has been prepared. A new base line for some convenient value of vertical force is then laid down on each sheet in the same way as is described for the elements of declination and horizontal force.

§ 9. *Dipping Needles, and Method of observing the Magnetic Dip.*

The instrument with which all the dips in the year 1880 have been observed (excepting during the month of March) is that which, for distinction, is called Airy's instrument. It is mounted on a stout block of wood in the Magnetic Office No. 7. The following description will probably suffice to convey an idea of its peculiarities:—

The form of the needles, the form of their axes, the form of the agate bearings, and the general arrangement of the relieving apparatus, are precisely the same as those in Robinson's and other instruments. But the form of the observing apparatus is greatly modified, in order to secure the following objects:—

I. To obtain a microscopic view of the points of the needles, as in the instruments introduced by Dr. Lloyd and General Sir E. Sabine.

II. To possess at the same time the means of observing the needles while in a state of vibration.

III. To have the means of observing needles of different lengths.

IV. To give an illumination to the field of view of each microscope, directed from the side opposite to the observer's eye, so that the light may enter past the point of the needle into the object glass of the microscope, forming a black image of the needle-point in a bright field of view.

V. To give facility for observing by day or night.

With these views, the following form is given to the apparatus:—

The needle, and the bodies of the microscopes, are inclosed in a square box. The base of the box, two vertical sides, and the top, are made of gun-metal (carefully selected to insure its freedom from iron); but the sides parallel to the plane of vibration of the needle are of glass. Of the two glass sides, that which is next the observer is firmly fixed; it is hereafter called "the graduated glass-plate." The other glass side can be withdrawn, to open the box, for inserting the needle, &c.

An axis, whose length is perpendicular to the plane of vibration of the needles, and is as nearly as possible in the line of the axis of the needle, supported on two bearings (of which one is cemented in a hole in the graduated glass-plate, the other being upon a horizontal bar near to the agate support of the needle-axis), carries a transverse arm, about 11 inches long, or rather two arms, projecting about $5\frac{1}{2}$ inches on each side of the axis. Each of these projecting arms carries three fixed microscopes, adapted in position to the lengths of the needles to be mentioned shortly.

The microscope-tube thus carried is not the entire microscope, but so much as contains the object-glass and the field-glass. Upon the plane side of the field-glass (which is turned towards the object-glass), a series of parallel lines is engraved by etching with fluoric acid. The object-glass is so adjusted that the image of the needle-point is formed upon the plane side of the field-glass; and thus the parallel lines can be used for observing the needle in a state of vibration; and, one of them being adopted as standard, the lines can be used for reference to the graduated circle (to be mentioned). All this requires that there be an eye-glass also for the microscope.

The axis of which we have spoken is continued through the graduated glass-plate, and there it carries another transverse arm parallel to the former, and generally similar to it, in which are fixed three sockets and eye-glasses. Thus, reckoning from the observer's eye, there are the following parts:—

(1.) The eye-glass.

(2.) The graduated glass-plate (its graduations, however, not intervening in this part of the glass, the graduated circle being so large as to include, within its circumference, all the microscopes).

(3.) The field-glass, on the further surface of which the parallel lines are engraved.

(4.) The object-glass.

(5.) The needle.

(6.) The removeable glass side of the box.

(7.) The illuminating reflector, to be described hereafter.

The optical part of the apparatus being thus described, we may proceed to speak of the graduated circle.

The graduations of the circle (whose diameter is about $9\frac{3}{4}$ inches) are etched on the inner surface of the graduated glass-plate. These divisions (as well as the parallel lines on the field glasses of the microscopes) are beautifully neat and regular, and appear to be superior to those engraved on metal. The same piece of metal, which carries the transverse arms supporting the microscope bodies, carries also two arms with verniers for reading their graduations. These verniers (being adapted to transmitted light) are thin plates of metal, with notches instead of lines. The reading of the verniers is very easy. The portion of the axis which is external to the graduated glass-plate (towards the observer), and which has there, as already stated, two arms for carrying the microscope eye-glasses, has also two arms for carrying the lenses by which the verniers and glass-plate graduations are viewed. These four arms are the radii of a circle, which can be fixed in position by a clamp, attached to the gun-metal casing of the graduated glass-plate, and furnished with the usual slow-motion screw.

The entire system of the two arms carrying the microscope-bodies, the two arms carrying the microscope eye-glasses, the two arms carrying the verniers, and the two arms carrying the reading-glasses for the verniers, is turned rapidly by means of a button on the external side of the graduated glass-plate, or is moved slowly by means of the slow-motion screw just mentioned.

It now remains only to describe the illuminating apparatus. On the outside of the removeable glass plate, there are supports for the axis of a metallic circle turning in a plane parallel to the plane of needle-vibration. This circle has four slotted radii, which support eight small frames carrying prismatic glass reflectors, each of which can turn on an axis that is in the plane of the circle but transverse to the radius. Two of these reflectors are for the purpose of sending light through the verniers, and therefore are fixed at the same radial distance as the verniers; the other six are intended for sending light past the ends of the needles through the six microscopes, and are therefore fixed at distances corresponding to the fixed microscopes. The circle was originally turned by a small winch near the observer's hand; at present, the winch is removed, as its axis was found to be slightly magnetic. At each observation, it is necessary to turn the circle which carries the reflectors; but this is the work of an instant.

The light which illuminates the whole is a gas-burner, in the line of the axis of rotation. Its rays fall upon the glass prisms, each of which, turning on its axis, can be adjusted so as to throw the reflected light in the required direction.

The whole of the apparatus, as thus described, is planted upon a horizontal plate admitting of rotation in azimuth: the plate is graduated in azimuth, and verniers are fixed to the gun-metal tripod stand. The gas-pipe is led down the central vertical axis, and there communicates by a rotatory joint with the fixed gas-pipes.

The needles adapted for use with this instrument are—

B_1, a plain needle	each 9 inches long.
B_2, a plain needle	
B_3, a loaded needle with adjustible load	
B_4, a needle whose plane passes through the axis of the needle	
C_1, a plain needle	each 6 inches long.
C_2, a plain needle	
C_3, a loaded needle with adjustible load	
C_4, a needle whose plane passes through the axis of the needle	
D_1, a plain needle	each 3 inches long.
D_2, a plain needle	
D_3, a loaded needle with adjustible load	
D_4, a needle whose plane passes through the axis of the needle	

The needles constantly employed are B_1, B_2, C_1, C_2, D_1, D_2.

In discussing carefully the observations taken with this instrument (as well as with other dip-instruments), great trouble was sometimes experienced in determining the zenith-point (or reading of the vertical circle when the points of the needle are in the same vertical). To remedy this, a "zenith-point-needle" was constructed by Mr. Simms, which has since been used as need required. It is a flat bar of brass; with pivots similar to those of the dip-needles; and with three pairs of points corresponding to the three lengths of needles used; loaded at one end so as to take a position perfectly definite with respect to the direction of gravity; observed with the microscopes, and reversed for another observation, exactly as the dip-needles. For each of the different lengths of dip-needles, the zenith-point is determined by observation of that pair of points of the zenith-point-needle whose interval is the same as the length of the dip-needle.

The instrument carries two levels, one parallel to the plane of the vertical circle, the other at right angles to that plane, by means of which the instrument is from time to time adjusted in level. The readings of the first-mentioned level have for some years (since 1867) been recorded at each separate observation of dip, and since the beginning of the year 1875 these observed readings have been regularly employed to correct the apparent value of dip for the small outstanding error of level. The instrument is maintained so nearly level that the correction usually amounts to a few seconds of arc only.

The Dip Instrument and all the needles are examined, at the close of each year, and at other times if thought desirable, by Mr. Dover. At the beginning of the year 1880 the instrument was more thoroughly cleaned than for some years previously. After its restoration the observed values of dip appeared to be small, but observations made with one of Mr. Dover's Dip Circles, No. 51, having four needles, lent by Mr. Dover to the Royal Observatory, entirely confirmed the results given by the Airy instrument. In the month of May 1880 new blocks, which permit the needles to be held firmly in position whilst being magnetised by the bars, were supplied by Mr. Dover.

§ 10. *Observations for the absolute Measure of the Horizontal Force of Terrestrial Magnetism.*

In the spring of 1861, a Unifilar Instrument, similar to those used in and issued by the Kew Observatory, was procured by the courteous application of General Sir Edward Sabine, from the makers, Messrs. J. T. Gibson and Son; and after having been subjected to the usual examinations, at the Kew Observatory, for determination of its constants (by the kindness of Professor Balfour Stewart), was mounted at the Royal Observatory. Observations with this instrument, which is mounted on a stout block of wood in the Magnetic Office No. 7, were commenced on 1861, June 11, and the instrument is still in use.

The deflected magnet (whose use is merely to ascertain the proportion which the power of the deflecting magnet at a given distance bears to the power of terrestrial magnetism) is 3 inches long, carrying a small plane mirror. The deflecting magnet is 4 inches long; it is a hollow cylinder, carrying in its internal tube a collimator, by means of which its time of vibration is observed in another apparatus. The frame which supports the suspension-piece of the deflected magnet carries also the telescope directed to the magnet-mirror; it rotates round the vertical axis of a horizontal graduated circle whose external diameter is 10 inches. The deflecting magnet is always placed on the east or west side of the deflected magnet, with one end towards the deflected magnet. In the reduction of the observations, the precepts contained in the skeleton form prepared at the Kew Observatory have received the strictest attention.

The following is the explanation of the method of reduction.

The distance between the centers of the deflected and deflecting magnets being known, it is found (from observations made at Kew) that the magnetism of the deflecting magnet is so altered by induction that the following multipliers of its magnetic moment ought to be used in computing the Absolute Force:—

At distance 1·0 foot, factor is	1·00031
1·1	1·00023
1·2	1·00018
1·3	1·00014
1·4	1·00011
1·5	1·00009

The correction of the magnetic power for temperature t_0 of Fahrenheit, reducing all to 35° of Fahrenheit, is

$$0\cdot00013126\,(t_0-35)\;+0\cdot000000259\,(t_0-35)^2$$

A_1 is $\frac{1}{2}$ (distance)^3 × sine deflection, corrected by the two last-mentioned quantities, for distance 1 foot; A_2 is the similar expression for distance 1·3 foot; P is $\frac{A_1 - A_2}{A_1 - \frac{A_2}{(1\cdot3)^2}}$; but this is not convenient for logarithmic calculation, especially as the values of the logarithms of A_1 and A_2 are, in the calculation, first obtained. The difference between A_1 and A_2 being small, (Log. A_1 − Log. A_2) $\frac{A_1}{\text{modulus}}$ may be written in the numerator in place of $A_1 - A_2$, and in the denominator A_1 may be put for A_2. Making these changes, P = (Log. A_1 − Log. A_2) $\frac{1\cdot69}{(1\cdot69-1)\text{ modulus}}$ = (Log. A_1 − Log. A_2) × 5·64. A mean value of P is adopted from various observations; then m being the magnetic moment of the deflecting magnet, and X the Horizontal component of the Earth's magnetic force, we have $\frac{m}{X} = A_1 \times \left(1 - \frac{P}{1}\right)$ for smaller distance, or $= A_2 \times \left(1 - \frac{P}{1\cdot69}\right)$ for larger distance. The mean of these is adopted for the true value of $\frac{m}{X}$.

For computing the value of mX from observed vibrations, it is necessary to know K, the moment of inertia of the magnet as mounted. The value of log. π^2K furnished by Professor Stewart is 1·66073 at temperature 30°, and 1·66109 at temperature 90°. Then putting T for the time of the magnet's vibration as corrected for induction, temperature, and torsion-force, the value of mX is $= \frac{\pi^2K}{T^2}$. From the combination of this value of mX with the former value of $\frac{m}{X}$, m and X are immediately found. In the year 1878, a new and entirely independent determination of the value of K was made. It very satisfactorily confirmed the adopted value.

It appears, from a comparison of observations given in the Introduction to the *Magnetical and Meteorological Observations*, 1862, that the determinations with the Old Instrument (in use to 1861) ought to be diminished by $\frac{1}{117}$ part, to make them comparable with those of the Kew Unifilar.

The computation of the values of m and X was, to the year 1857, made in reference to English measure only, using the foot and the grain as the units of length and weight; but, for comparison with foreign observations of the Absolute Intensity of Magnetism, it is desirable that X should be expressed also in reference to Metric measure, in terms of the millimètre and milligramme. If an English foot be supposed equal to α times the millimètre, and a grain be equal to β times the milligramme, then it is seen that, for the reduction of $\frac{m}{X}$ and mX to Metric measure, these must be multiplied by α^3 and $\alpha^2\beta$ respectively. Hence X^2 must be multiplied by $\frac{\beta}{\alpha}$, and X

by $\sqrt{\frac{\beta}{\alpha}}$. Assuming that the mètre is equal to 39·37079 inches, and the gramme equal to 15·43249 grains, log. $\sqrt{\frac{\beta}{\alpha}}$ will be found to be = 9·6637805, and the factor for reducing the English values of X to Metric values will be 0·46108 or $\frac{1}{2\cdot 1689}$. The values of X in Metric measure thus derived from those in English measure are given in the proper table. The value of X is sometimes required in terms of the centimètre and gramme, commonly known as the C. G. S. unit (centimètre-gramme-second unit), and values in terms of this unit are obtained by dividing those referred to the millimètre and milligramme by 10.

§ 11. *Explanation of the Tables of Results of the Magnetical Observations.*

The results contained in this section (so far as relates to the three magnetometers) are founded upon or derived entirely from the measures of the ordinates of the Photographic Curves, and refer to the astronomical day.

Before further discussing the records, the first step usually taken is to divide the days of observation into two groups; in one of which the magnetism was generally so tranquil that it appeared proper to use those days for determination of the laws of diurnal inequality; while in the other group the movements of the magnetic instruments were so violent, and the photographic curves traced by them so irregular, that it appeared impossible to employ them, except by the exhibition of every motion of the magnet during the day. A similar division into groups had been made in two Memoirs printed in the *Philosophical Transactions*. In the year 1880 there are three days exhibiting practically the amount of irregularity which had been considered as defining the class of Days of Great Disturbance in the Memoirs mentioned. These days are August 12, 13, and November 3. There is lesser but noteworthy disturbance also on August 10, 11, and November 2.

Separating the days of great disturbance, the photographic sheets for the remaining generally tranquil days, including those for August 10, 11, and November 2, were thus treated:—Through each photographic curve a pencil line was drawn, representing, as well as could be judged, the general form of the curve without its petty irregularities. These pencil curves only were then used; and their ordinates were measured, with the proper pasteboard scales, at every hour. These measures being entered in a form having double argument, the vertical argument ranging through the 24 hours of the astronomical day, and the horizontal argument through the days of a calendar month, the means of the numbers standing in the vertical columns give the mean daily value of the element, and the means

of the numbers in the horizontal columns the mean monthly value at each hour of the day.

The temperature of the magnetometers was maintained in so great uniformity through each day that the final determination of the diurnal inequalities of horizontal and vertical force should possess great exactitude, although, in regard to vertical force, the magnitude of the temperature co-efficient introduces an element of some uncertainty. It was, however, impossible to maintain similar uniformity of temperature through all the seasons. Following the general principle adopted in recent years, the results are given uncorrected for temperature; corresponding tables of mean temperature being now in all cases added. It is deemed best that, in the yearly volumes, the results should be thus given, as more easily admitting of independent examination. When, as is done from time to time, the results for series of years are collected for general discussion, the temperature corrections are duly taken into account.

In regard to the measurement of ordinates on disturbed days, including both those of greater and lesser disturbance, it is only necessary to explain that the assistant charged with the translation of the curve-ordinates into numbers, remarking the salient points of the curve, or the points which if connected by straight lines would produce a polygon not sensibly differing from the photographic curve, applies to each of these the scale proper for the element under consideration: the position of the scale on the time-scale determines the time, and the reading of the scale for the point of the photographic curve gives the quantity, which is to be applied to the value of the new base-line. The ordinate-reading so formed is printed without alteration in the Tables. The temperatures referring to the measures of Horizontal Force and Vertical Force on days of disturbance are given on the right-hand page of the section. As before, it is to be understood that the indications for Horizontal Force and Vertical Force are not corrected for temperature.

It has been the custom, in preceding volumes, to exhibit the varying Declination in the sexagesimal divisions of the circle, and the variable parts of the Horizontal Force and the Vertical Force, in terms of the whole Horizontal Force and whole Vertical Force respectively. This custom is still retained; but since the year 1872 an addition has been made, carrying out the principle suggested by C. Chambers, Esq., Superintendent of the Colaba Observatory, Bombay, that all the variable inequalities should be expressed in terms of Gauss's Magnetic Unit. In applying this principle, reference is made to metrical units of measure and weight instead of British units; a change from the first proposal, which, it is believed, has received the assent of Mr. Chambers. The formulæ for converting the original numbers into the new numbers are the following:—

$$\frac{\text{Variations of H. F. in metrical measure}}{\text{H. F. in metrical measure}} = \frac{\text{Variation in former measure}}{\text{Whole value in former measure}}$$

from which,

$$\text{Variation of H. F. metrical} = \frac{\text{H. F. metrical}}{\text{Former H. F.}} \times \text{former variation.}$$

The mean value, for the year, of $\frac{\text{H. F. metrical}}{\text{Former H. F.}} = 1{\cdot}804$; and this therefore is the factor to be employed for transformation.

Similarly,

$$\text{Variation of V. F. metrical} = \frac{\text{V. F. metrical}}{\text{Former V. F.}} \times \text{former variation.}$$

The Former V. F. (in the same manner as Former H. F.) = 1; but the V. F. metrical = H. F. metrical × tan. dip. The factor is therefore 1·804 × tan. 67°. 35′. 37″ = 4·3754.

The values given in Tables VIII. and XIII. and at the bottom of the left-hand page in the section of disturbed days for the adopted zeros (in metrical units) of the variable forces, are formed by multiplying 0·8600 and 0·9600 (the adopted zeros in the former expressions) by these factors respectively.

For Variation of Declination, expressed in minutes, the metrical factor is 1·804 × sin. 1′ = 0·0005248.

The measures as referred to the metrical unit (millimètre-milligramme-second), are converted into measures on the centimètre-gramme-second (C. G. S.) system by dividing by 10.

In preceding years, allusion has been made to the occasional dislocations of the curve of Vertical Force. No such dislocation has occurred during the year 1880.

On examining the monthly values of Vertical Force in each year since the mounting of the Vertical Force Magnet which has been used since 1865, it is remarked that the value for each December is less than that for the preceding January by about $\frac{1}{100}$ part of the whole: a quantity far greater than the change deduced from the combination of Dip and Absolute Horizontal Force. This is undoubtedly caused by gradual diminution of the power of the magnet; its determination is supported by the increase in the time of horizontal vibration.

In the Tables of Results of Observations of the Magnetic Dip, the result of each separate observation of Dip with each of the six needles in ordinary use is given, and also the concluded monthly and yearly values for each needle.

The table giving the results of the observations for Absolute Measure of Horizontal Force requires no particular explanation.

§ 12. *Wires and Photographic self-registering Apparatus for continuous Record of Spontaneous Terrestrial Galvanic Currents.*

In order to obtain an exhibition of the spontaneous galvanic currents which in some measure are almost always discoverable in the earth, and which occasionally are very

powerful, it was necessary to extend two insulated wires from an earth connexion at the Royal Observatory, in two directions nearly at right angles to each other, to considerable distances, where they would again make connexion with the earth. By the kindness of the Directors of the South Eastern Railway Company, to whom the Royal Observatory has on several occasions been deeply indebted, two connexions were made in the year 1862; one to a station near Dartford, and the other to a station near Croydon, the wires passing from the Royal Observatory to the Greenwich Railway Station, and thence along the lines of the South-Eastern Railway. These circuits remained in use until the end of the year 1867. Experience having shown that a much smaller separation of earth plates would suffice, and it appearing that advantage might arise from making the two earth connexions for each circuit on opposite sides of, and, as nearly as might be, equi-distant from the Observatory, positions for earth plates were selected at Angerstein Wharf (on the bank of the river Thames) and Lady Well for one circuit, and at the Morden College end of the Blackheath Tunnel, and the North Kent East Junction of the South-Eastern Railway, for the other circuit. These new circuits were brought into use in August 1868. The wires pass, as before, from the Royal Observatory to the Greenwich Railway Station, and thence along the lines of the South-Eastern Railway to the respective earth plates. In this arrangement there is of course no earth connexion at the Observatory. The direct distance between the earth plates of the Angerstein Wharf—Lady Well circuit is 3 miles, the azimuth of the line (reckoning from astronomical north towards east) being 32°; in the Blackheath—North Kent East circuit the corresponding distance is $2\frac{1}{2}$ miles, and the azimuth 116°. The actual lengths of wire, in the circuitous courses which the wires necessarily take, are about $7\frac{1}{2}$ miles and 5 miles respectively. The identity of the Observatory ends of the four branches is tested from time to time as may appear necessary. In 1880 August, in consequence of temporary defects in the wires, the Lady Well and North Kent East branches were discarded, and the Angerstein Wharf and Blackheath branches connected, at the Observatory, each to an independent earth, and these circuits remained in use during the rest of the year.

For measuring and recording the strength of the two earth currents there is included in each circuit at the Royal Observatory a horizontal galvanometer having its magnet suspended by a hair. In each galvanometer coil there are 150 turns of No. 29 copper wire, or 300 turns in the double coil of each instrument. For obtaining photographic record the galvanometer magnet carries below itself a small plane mirror on which the light of a gas lamp, passing through a small aperture, falls: the divergent pencil is converted into a convergent pencil by refraction through crossed cylindrical lenses, one with axis vertical before the pencil reaches the mirror, and one with axis horizontal where the pencil is received from the mirror. Thus a spot of light is formed upon the photographic paper of the revolving cylinder in the same

way as for the magnetic registers. The two earth-current registers are made on opposite sides of the same cylinder, and upon different parts of the sheet, one gas light serving for both registers.

A portion of a zero-line for either record is obtained at any time by simply breaking the galvanic communication.

The photograph records were regularly made, with the wires in the first position, from 1865, March 15, to the end of 1867. Fifty-three days, on which the magnetic disturbances were active, were selected for special examination; and for these the equivalent galvanic currents in the north and west directions were computed, and their effects in producing apparent magnetic disturbances in the west and north directions were inferred. They correspond almost exactly with those indicated by the magnetometers. Then the records for all the days of tranquil magnetism were reduced in the same manner, not for comparison with the magnetometer-results, but for ascertaining the diurnal laws of the galvanic currents. These laws were found to be very different from the laws of magnetic diurnal inequalities. These discussions have been communicated to the Royal Society in two papers, printed respectively in the *Philosophical Transactions* for 1868 and 1870.

The records with the earth connexions in the new positions have been regularly made since 1868, August 20, but have not yet been discussed.

§ 13. *Standard Barometer.*

The Barometer is a standard, by Newman, mounted in 1840. It is fixed on the South wall of the West arm of the Magnetic Observatory. The tube is $0^{in}\cdot565$ in diameter; the cistern is of glass. The depression of the mercury due to capillary attraction is $0^{in}\cdot002$, but no correction is on this account applied. The graduated scale which measures the height of the mercury is made of brass, and to it is affixed a brass rod, passing down the inside of one of the upright supports, and terminating in a conical point of ivory; this point in observation is made just to touch the surface of the mercury in the cistern, and the contact is easily seen by the reflected and the actual point appearing *just* to meet each other. The rod and scale are made to slide up and down by means of a slow-motion screw. The scale is divided to $0^{in}\cdot05$.

The vernier subdivides the scale divisions to $0^{in}\cdot002$; it is moved by a slow-motion screw, and in observation is adjusted so that the ray of light, passing under the back and front of the semi-cylindrical plate carried by the vernier, is a tangent to the highest part of the convex surface of the mercury in the tube.

At the bottom of the instrument are three screws, turning in the fixed part of the support, and acting on the piece in which the lower pivot of the barometer-frame turns, for adjustment to verticality: this adjustment is examined occasionally.

The readings of this barometer, until 1866, August 20^d. 0^h, are considered to be coincident with those of the Royal Society's flint-glass standard barometer. On that day a change was made in the barometer. It had been remarked that the slow-motion-screw at the bottom of the sliding rod (for adjusting the ivory point to the surface of the mercury in the cistern) was partly worn away: and on August 20 the sliding rod was removed from the barometer by Mr. Zambra to remedy this defect. It was restored on 1866, August 30^d. 3^h. Before the removal of the sliding rod, barometric comparisons had been made with a standard barometer the property of Messrs. Murray and Heath, and with two barometers, Negretti and Zambra, Nos. 646 and 647. While the sliding rod of the Greenwich standard was removed, Negretti and Zambra 647 was used for daily observations. After the new equipment of the standard barometer, another series of comparisons with the same barometers was made: from which it was found (the three auxiliaries giving accordant results) that the readings of the barometer, in its new state, required a correction of $-0^{in}\cdot006$. This correction has been applied to every observation commencing with that at 1866, August 30^d. 9^h.

In the spring of the year 1877 an elaborate comparison of the Standard Barometers of the Greenwich and Kew Observatories was made under the direction of the Kew Committee. (See *Proceedings of the Royal Society*, vol. 27, page 76.) Mr. Whipple, Superintendent of the Kew Observatory, brought four barometers to Greenwich on three separate occasions. The result of a large number of comparisons showed that the difference between the Greenwich and Kew standards does not exceed 0·001 inch. In this is of course included the above-mentioned correction of $-0^{in}\cdot006$.

The height of the cistern above the mean level of the sea is 159 feet. This element is founded upon the determination of Mr. Lloyd, in the *Philosophical Transactions*, 1831; the elevation of the cistern above the brass piece inserted in a stone in the transit-room, now the Astronomer Royal's official room (to which Mr. Lloyd refers), being 5^{ft}. 2^{in}.

The barometer has usually been read at 21^h, 0^h, 3^h, 9^h (astronomical), and corrected by application of the index error given above. Every reading has been reduced to the reading which would have been obtained at the temperature 32° of the mercury, and corrected for expansion of the brass scale, by application of the correction given in Table II. (pages 82 to 87) of the "Report of the Committee of Physics" of the Royal Society. For immediate use the mean of the reduced readings has then been taken for each civil day, and finally converted into mean daily reading, by application of the correction inferred from Table XIV. of the "Reduction of Greenwich Meteorological Observations, 1847–1873." These results do not appear in the present volume, but results deduced from the photographic records, as will be further on mentioned (in § 25).

In the printed record of the barometrical and all other meteorological observations, the day is to be understood, generally, as defined in civil reckoning.

§ 14. *Photographic self-registering Apparatus for continuous Record of the Readings of the Barometer.*

The Photographic self-registering Apparatus for continuous Record of Magnetic Vertical Force is furnished (as has been stated) with a vertical cylinder covered with photographic paper and revolving in 24 hours. North of the surface of this cylinder, at the distance of about 30 inches, is a large syphon barometer, the bore of the upper and lower extremities of its arms being about 1·1 inch. A glass float, for which at the beginning of the year 1879 a metallic float was substituted, partly immersed in the mercury of the lower extremity is partially supported by a counterpoise acting on a light lever, leaving a definite part of the weight of the float to be supported by the mercury. This lever is lengthened to carry a vertical plate of opaque mica having a small horizontal slit, whose distance from the fulcrum is nearly eight times the distance of the point of attachment of the float wire, and whose movement, therefore, is nearly four times the movement of the column of a cistern-barometer. Through this slit the light of a lamp, collected by a cylindrical lens, shines upon the photographic paper. The barometer rests on a platform which can be raised or lowered by a screw, so as to bring the photographic trace to a convenient part of the sheet. As regards the effect of temperature, it will be understood, from the construction of the apparatus, that the record is influenced only by the expansion of the column of mercury (about 4 inches in length) in the lower tube of the barometer; and from this circumstance, in combination with the near uniformity of temperature maintained in the basement, no perceptible effect is produced on the register.

The scale of time is established by means of occasional interruptions of the light, and the scale of measure by comparison of observed variations of the standard barometer with the corresponding differences of the photographic ordinates. A new base line for some convenient value of barometer reading is then laid down on each sheet, in the same way as for the various magnetic elements.

This barometer was brought into use in 1848, but its indications were not satisfactory till the mercury was boiled in the tube by Messrs. Negretti and Zambra on 1853, August 18, since which time they have appeared unexceptionable.

A discussion of the photographic records of the Barometer from 1854 to 1873 is published in the "Reduction of Greenwich Meteorological Observations, 1847–1873."

§ 15. *Thermometers for ordinary Observation of the Temperature of the Air and of Evaporation.*

The Dry-Bulb Thermometer, the Wet-Bulb Thermometer, the Maximum Self-Registering Thermometers, both dry and wet, and the Minimum Self-Registering

Thermometers, dry and wet, for determination of the temperature of the air and of evaporation, are mounted on a revolving frame whose fixed vertical axis is planted in the ground. From the year 1846 to 1863 the post forming the vertical axis was about 23 feet south (astronomical) of the S.W. angle of the south arm of the Magnetic Observatory; in 1863 it was moved to its present position, about 35 feet south (astronomical) of the S.W. angle. A frame revolves on this post, consisting of a horizontal board as base, of a vertical board projecting upwards from it connected with one edge of the horizontal board, and of two parallel inclined boards (separated about three inches) connected at the top with the vertical board, and at the bottom with the other edge of the horizontal board. The outer inclined board is covered with zinc. The air passes freely between all these boards. In September of the year 1878 some small additions were made, mainly with the object of better protecting the thermometers from the influence of radiation.

The dry and wet-bulb thermometers are attached to the outside, and near the center of the vertical board; their bulbs are about 4 feet above the ground and projecting from 2 inches to 3 inches below the horizontal board. The maximum and minimum thermometers for air are placed towards one vertical edge, and those for evaporation towards the other vertical edge, with their bulbs at almost the same level, and near to those of the dry and wet-bulb thermometers. Above the thermometers is a small projecting roof to protect them from rain. The frame is always turned with the inclined side towards the sun. It is presumed that the thermometers are thus sufficiently protected.

The graduations of all the thermometers used in the Royal Observatory since the year 1840 rest fundamentally upon those of a Standard Thermometer, the property of Mr. Glaisher, which derives its authority from comparison with original thermometers constructed by the late Rev. R. Sheepshanks about the years 1840–1843, in the course of his preparations for the construction of the National Standard of Length. The whole of the radical determinations of Freezing Point, Boiling Point, and Subdivision of Volume of Tube, were made by Mr. Sheepshanks with the utmost care: it is believed that these were the first original thermometers that had been constructed in England for many years. This thermometer continued to be the standard of reference until June of the year 1875.

By the kindness of the Kew Committee of the Royal Society, a new Kew Standard Thermometer, No. 515, was, in the year 1875, supplied to the Royal Observatory; and, commencing with the month of July of that year, all thermometers have been compared with the new standard, which will hereafter be referred to as the R. O. standard.

In order to determine whether any sensible difference exists between the indications of Mr. Glaisher's standard and those of the R. O. standard, the errors of all thermometers that, in the year 1875, had been recently referred to both standards, were

collected for comparison. The details of this comparison will be found in the Introduction to the Magnetical and Meteorological Observations for 1875, page *xlviii*. The result arrived at was that the standards were practically identical.

The Dry-Bulb and Wet-Bulb thermometers are by Negretti and Zambra, No. 45354 as dry-bulb and No. 45355 as wet-bulb. They require no correction.

The self-registering thermometers for temperature of air and evaporation are by Negretti and Zambra. The construction of the thermometers for maximum temperature is as follows. There is a small detached piece of glass in the tube, at the bent part (near the bulb), through which the piece of glass cannot pass down. The column of mercury in rising is forced through the contraction produced by the piece of glass; but in falling it is unable to pass the glass, and the lower mass of mercury descends into the bulb, leaving a vacant space below the glass, and a portion of the mercury above it. The piece of glass operates as an efficient valve. The thermometer used for maximum temperature of the air was No. 8527; it required a subtractive correction of 0°·9. The maximum wet-bulb thermometer was No. 44285; it required correction as follows:—

	°	°
Below	55	0·0
Above	55	subtract 0·1

The thermometers for minimum temperature are alcohol thermometers (on Rutherford's principle). A sliding glass index allows the alcohol in rising to pass above it, but is drawn down by the peculiar action of the bounding surface of the fluid when it sinks. The readings of that for minimum temperature of the air, No. 4386, required no correction. The minimum wet-bulb, No. 3627, required an additive correction of 0°·9.

The eye-readings of the dry-bulb and wet-bulb thermometers have usually been taken at the hours (astronomical reckoning) 21^h, 0^h, 3^h, 9^h, and corrected by application of the corrections already given. For immediate use the means of the corrected readings of the dry-bulb and wet-bulb thermometers have been taken and converted into mean daily readings, by the application of a correction inferred from Table LI. of the "Reduction of Greenwich Meteorological Observations, 1847–73," but the results do not appear in this volume, the photographic records being now employed, as will be further on explained (in § 25).

§ 16. *Photographic self-registering Apparatus for continuous Record of the Readings of the Dry-Bulb and Wet-Bulb Thermometers.*

About 28 feet south (magnetic) of the south-east angle of the south arm of the Magnetic Observatory, and about 25 feet east of the thermometers for eye-observa-

tions, is an open shed 10 ft. 6 in. square, standing upon posts 8 feet high, under which are placed the photographic thermometers, the dry-bulb thermometer towards the east, and the wet-bulb thermometer towards the west. The bulbs of the thermometers are 8 inches in length, and 0·4 inch internal bore, and their centers are about 4 feet above the ground. The bulb of the thermometer employed as wet-bulb is covered with muslin throughout its whole length, which is kept moist by means of capillary passage of water along cotton wicks leading from a vessel filled with water.

There are small adjustments admitting the raising or dropping of the thermometers, so that the register of their changing readings may fall on a convenient part of the paper. The thermometer frames are covered by plates having longitudinal apertures, so narrow, that any light which may pass through them is completely, or almost completely, intercepted by the broad flat column of mercury in the thermometer-tube. Across these plates a fine wire is placed at every degree; those at the decades of degrees, and also those at 32°, 52°, and 72°, being coarser than the others. A gas lamp is placed about 9 inches from each thermometer (east of the dry bulb and west of the wet bulb), and its light, condensed by a cylindrical lens, whose axis is vertical, shines through the thermometer-tube above the surface of the mercury, and forms a well-defined line of light upon the photographic paper, which is wrapped around the cylinder. The axis of this cylinder is vertical; its mounting is in all respects similar to that of the Vertical Force cylinder. As the cylinder, covered with photographic paper, revolves under the light, which passes through the thermometer-tube, it receives a broad sheet of photographic trace, whose breadth (in the direction of the axis of the cylinder) varies with the varying height of the mercury in the thermometer-tube. Parts of the light in its passage are intercepted by the wires placed across the tube at every degree, and there are, therefore, left upon the paper corresponding lines in which there is no photogenic action. In consequence of a want of complete uniformity in different parts of the photographed scales, owing to inequality in the bore of the tube in both thermometers, new thermometers with better tubes were prepared by Messrs. Negretti and Zambra, and mounted on 1878, November 1. By this means the scales on the paper were rendered quite uniform.

The cylinder was at first made to revolve in 48 hours; the daily photographic traces of the two thermometers were thus simultaneously registered on opposite sides of the cylinder, sometimes slightly intermixing. The length of the glass cylinder used till 1869, March, is $13\frac{1}{2}$ inches, and its circumference is about 19 inches. On 1869, March 5, an ebonite cylinder was introduced, whose length is 10 inches, and circumference about 19 inches; and at a later time the cylinder was made to revolve in 50 hours instead of 48 hours, to insure the separation of the records of the two thermometers. In March of the year 1878 the time of revolution was further increased to 52 hours.

The photographic records of the dry-bulb and wet-bulb thermometers have been discussed from 1848 to 1868. The results exhibit the diurnal inequality of the temperature of the air and of evaporation, as grouped by months, as grouped by periods of high and low temperature, as grouped by periods of high and low atmospheric pressure, as grouped by cloudless or overcast sky, and as grouped by directions of the wind. They are published in the "Reduction of Greenwich Meteorological Observations, 1847–1873."

§ 17. *Thermometers for Solar Radiation and Radiation to the Sky.*

The thermometer for Solar Radiation, which to the end of the year 1864 was placed in an open box about 10 feet south of the south-west angle of the south arm of the Magnetic Observatory, is now laid on the grass, near the same place. On 1880, January 31, it was shifted to a position on the grass south of the Magnetic Offices.

The thermometer is a self-registering maximum mercurial thermometer of Negretti and Zambra's construction; its bulb is blackened, and it is enclosed in a glass sphere from which the air has been exhausted. It is read at 21^h, 0^h, 3^h, and 9^h daily; the highest of these readings is adopted as the maximum for the day. The thermometer used until February 27 was No. 43418; from February 27 until March 25, No. 44024; from March 25 until August 20, No. 38593; and from August 21, No. 38592. The index errors of these thermometers were extremely small, and no corrections have been applied.

The use of a thermometer with blackened bulb not inclosed in an exhausted sphere was discontinued at the end of 1865.

The thermometer for radiation to the sky is placed near to the Solar Radiation thermometer, with its bulb resting on short grass, and fully exposed to the sky. It is a self-registering minimum spirit thermometer of Rutherford's construction, Horne and Thornthwaite No. 3120. Its graduation is practically correct, and the numbers inserted in the table are those read from the scale without alteration. It is read every day at 21^h, and, except in summer, also at 9^h.

§ 18. *Thermometers sunk below the Surface of the Soil at different Depths.*

These thermometers were made by Messrs. Adie of Edinburgh, under the immediate superintendence of the late Professor J. D. Forbes. The graduation was made by Professor Forbes himself.

The thermometers are four in number. They are all placed in one hole in the ground, the diameter of which in its upper half is 1 foot, and in its lower half about

6 inches. Each thermometer is attached in its whole length to a slender piece of wood, which is planted in the hole with it. The place of the hole is 20 feet south (magnetic) of the extremity of the south arm of the Magnetic Observatory, and opposite the center of its south front.

The soil consisted of beds of sand; of flint-gravel with a large proportion of sand; and of flints with a small proportion of sand, cemented almost to the consistency of pudding-stone. Every part of the gravel and sand extracted from the hole was perfectly dry.

The bulbs of the thermometers are cylindrical, 10 or 12 inches long and 2 or 3 inches in diameter. The bore of the principal part of the tubes, from the bulb to the graduated scale, is very small. In that part to which the scale is attached, the tube is larger.

The thermometer No. 1 was dropped into the hole to such a depth that the center of its bulb was 24 French feet (25·6 English feet) below the surface: then dry sand was poured in till the hole was filled to nearly half its height. Then No. 2 was dropped in till the center of its bulb was 12 French feet below the surface; No. 3 and No. 4 till the centers of their bulbs were respectively 6 and 3 French feet below the surface: and the hole was then completely filled with dry sand. The upper parts of the tubes, carrying the scales, were left projecting above the surface: No. 1 by 27·5 inches, No. 2 by 28·0 inches, No. 3 by 30·0 inches, and No. 4 by 32·0 inches. Of these lengths, the parts 8·5, 10·0, 11·0, and 14·5 inches, respectively, are tube with narrow bore.

The projecting parts of the tubes are protected by a wooden case or box fixed to the ground; the sides of the box are perforated with numerous holes, and it has a double roof. In the North face of this box is a large plate of glass through which the thermometers are read. Within the box are two smaller thermometers, one (No. 5) whose bulb is sunk one inch in the ground, and one (No. 6) whose bulb is in the free air nearly in the center of the box.

The fluid of the four long thermometers is alcohol tinged with a red colour.

The lengths of 1° on the scales of Nos. 1, 2, 3 and 4, are respectively about 1·9 inch, 1·1 inch, 0·9 inch, and 0·5 inch; and the ranges of the scales, as first mounted, were, 43°·0 to 52°·7, 42°·0 to 56°·8, 39°·0 to 57°·5, and 34°·2 to 64°·5.

These ranges for Nos. 2, 3, and 4, were found to be insufficient in some years, particularly those of Nos. 3 and 4, or the thermometers sunk to the depth of 6 feet and 3 feet.

In 1857 Messrs. Negretti and Zambra removed from Nos. 3 and 4 a quantity of fluid corresponding to the extent of 5° on their scales, and the scales of these two thermometers were then lowered by that linear extent, making the readings the same as before.

In subsequent years it was found that the amount of fluid removed was somewhat too great, for at the lower end of the scale the 6-foot thermometer sometimes fell below the limit of its scale or 44°; and the 3-foot thermometer below 39°·0; in which cases the alcohol sank into the capillary tube.

The readings at the early part of the series were at times defective at high temperatures, but always complete at low temperatures; afterwards, they were generally complete at high temperatures, and at times defective at low temperatures. The two combined, however, will enable us to complete all readings.

In 1869, Mr. Zambra removed fluid from No. 1 to the amount of 2°·7, and from No. 2 to the amount of 1°·5, and inserted in No. 4 fluid to the amount of 1°·5. The scales were re-engraved, to make the reading at every temperature the same as before.

In 1877, May, new opal glass scales were applied to these thermometers, by which the facility of reading is much increased.

The ranges of the scales are now,—for No. 1, 46°·0 to 55°·5; for No. 2, 43°·0 to 58°·0; for No. 3, 44°·0 to 62°·0; and for No. 4, 37°·0 to 68°·0.

These thermometers are read every day, at noon, and the readings appear in the printed volumes without correction. The index errors of Nos. 1, 2, 3, and 4 are unknown, but from comparisons made with the standard thermometer in November 1879 it would appear that No. 5 reads too high by 0°·2, and No. 6 too high by 0°·4.

The observations of these thermometers from 1846 to 1859 have been elaborately reduced by Professor Everett; the results are printed as an Appendix to the Greenwich Observations for 1860. Abstracts of the observations of these thermometers (giving mean monthly temperatures) for the period 1847 to 1873 have since been published in the "Reduction of Greenwich Meteorological Observations 1847–1873."

§ 19. *Osler's Anemometer.*

This anemometer is fixed above the north-western turret of the ancient part of the Observatory, and is self-registering: it was made by Newman, on a plan furnished by A. Follett Osler, Esq., F.R.S., but has received several changes since it was originally constructed. A large vane, which is turned by the wind, and from which a vertical spindle proceeds down nearly to the table in the north-western turret, gives motion by a pinion upon the spindle to a rack-work carrying a pencil. In 1866 the vane-shaft was made to bear upon anti-friction-rollers running in a cup of oil. The pencil makes a mark upon a paper affixed to a board which is moved uniformly in a direction transverse to the direction of the rack-motion. The movement of the board is effected by means of a second rack connected with the pinion of a clock.

The paper has lines printed upon it corresponding to the positions which the pencil must take when the direction of the vane is N., E., S., or W.; and also has transversal lines corresponding to the positions of the pencil at every hour. The original adjustment for azimuth, made in the year 1841, was obtained by observing, from a certain point on the roof of the octagon room, the time of passage of a star behind the vane-shaft, and computing from that observation the azimuth, by which means the direction plate, placed above the registering table, was adjusted to position. Then, on a calm day, the direction pointer (to which reference is made in adjusting, on the sheet, the position of the direction pencil) was brought into exact correspondence with the large vane. The adjustment for azimuth was further verified by observation of stars in the year 1850, and again in the year 1878. A fixed mark, at a known azimuth, is now attached to the north-eastern turret for the purpose of at any time examining the position of the direction plate.

For the pressure of the wind the construction originally arranged by Mr. Osler was in use till the middle of 1866, when certain modifications were made in it by Mr. Browning, as represented in Figure 3 of the engraving at the end of the Introduction to the volume for 1866. To the vane-shaft is attached a rectangular frame C, which rotates with the vane. To this frame are firmly attached the ends of four strong springs D, which rise from the point of attachment in a vertical direction, are then bent so as to descend below the frame C, and are then bent upwards so as to rise a short distance, where they terminate, each of them thus forming a large hook. To the interior of each strong spring, near to its upper bend, is affixed a very weak spring, which descends free into the lower bend or hook of the strong spring, so that its lower end may be moved by a light pressure till it reaches and takes bearing against the bent-up part of the strong spring, after which it cannot be further moved without moving the strong spring, and will therefore require much greater pressure. The four ends of these four light springs carry the circular pressure-plate A by the following connexions. The two which are farthest from A, or which are below the wide part of the vane, are united by a light horizontal cross-bar G; and from the ends of these springs proceed four light bars E, which are attached to points of the pressure-plate A, near its circumference. The two ends of light springs which are nearest to A are also united by a light horizontal cross bar, which is attached to a projection from the center of the plate A. (The diagonal lines upon A, in the diagram, represent indistinctly two strengthening edge-bars upon the pressure-plate, and the projection above mentioned is fixed to their intersection.) The weight of the pressure-plate thus rests entirely on the slender springs; it is held steadily in position, as regards the opposition to the wind, and it moves without sensible friction. A light wind drives it through a considerable space, until the ends of one pair of light springs touch their large hooks; then for every additional pound of pressure the movement

is smaller, till the ends of the other pair of light springs touch their large hooks; after this the movement for every additional pound of pressure is still further diminished. This apparatus was arranged by Mr. Browning. The communication with the pencil below is similar to that in the first construction: the cord and pulley are omitted in the drawing to avoid confusion.

The pressure-pencil below is carried by a radial bar, whose length is parallel to the scale of hours; it is brought to zero by a light spring.

In the early part of the year 1880 the pressure apparatus was entirely renovated, parts of it having become much worn. New springs were supplied, and the area of the pressure plate, which, until the year 1866, had been 1 square foot, then increased to 2 square feet, was now reduced to $1\frac{1}{3}$ square feet or 192 square inches, in order that, by contracting somewhat the scale of pressure on the paper, pressures up to 50 lbs. on the square foot might be registered. The apparatus was dismounted on February 10, but on account of various alterations the new apparatus was not brought to a complete state until May 1. Finally, in September, the clock motion was changed in order to reduce the time scale to equality with the scales for magnetic declination and horizontal force.

A rain gauge of peculiar construction is carried by this instrument, by which the fall of rain is registered with reference to the time of the fall. It is described in § 21.

A fresh sheet of paper is applied to this instrument every day at 22^h mean solar time. In September 1880 the hour of changing the sheet was altered to noon.

§ 20. *Robinson's Anemometer.*

Two instruments, constructed on the principle described by Dr. Robinson in the *Transactions of the Royal Irish Academy*, vol. xxii., have been at different periods in use. The first, made by Negretti and Zambra, and used from 1859, October, to 1866, October, did not give a continuous record, and required to be read off from time to time. The second instrument, made by Mr. Browning, and used since 1866, October, gives a continuous register. Both instruments have been mounted above the small building on the roof of the Octagon Room. The principal parts of the Browning instrument are represented in Figures 1 and 2 of the engraving at the end of the Introduction for 1866. The motion is given (as in the former instrument) by the pressure of the air on four hemispherical cups, the distance of the center of each from the axis of rotation being 15·00 inches. The foot of the axis is a hollow flat cone bearing upon a sharp cone which rises up from the base of a cup of oil. The horizontal arms are connected with a vertical spindle, upon which is an endless screw working in a toothed wheel connected with a train of wheels, furnished with indices capable

of registering one mile and decimal multiples of a mile up to 1,000 miles. A pinion C upon the axis of one of the wheels (which, in the figure, occupies a place too high) acts in a rack J, drawing it upwards by the ordinary motion of the revolving cups. The rack is pressed to the pinion by a spring, and, when it has been drawn up, it can be pressed by hand in opposition to the spring so as to release it from the pinion, and can then be pushed down, again to be raised by the action of the wheel-work. The rack is connected at the bottom with a sliding rod D, which passes down into the chamber below, where it draws up the sliding pencil-carrier E. The pencil F, which it carries, traces its indications upon the sheet of paper wrapped round a barrel, whose axis is vertical, and which by spindle connexion with the clock H is made to revolve in 24 hours. The revolving cups and wheel-work are so adjusted that a motion of the pencil upwards of one inch represents a motion of the air through 100 miles. The curve traced upon the barrel exhibits, therefore, the aggregate of the air's movements, and also the air's velocity, at every instant of the day.

In September 1880 a new cylinder of smaller diameter was supplied by Browning, by which the time-scale was reduced in the same proportion and to the same dimensions as that of Osler's Anemometer (page *lii*).

In the year 1860, on July 3, 4, and 13, experiments were made in Greenwich Park, with the instrument by Negretti and Zambra, then in use, to ascertain the correctness of the theory of Robinson's anemometer; the point to be verified being that the scale of the instrument, founded on the supposition that the horizontal motion of the air is about three times the space described by the centers of the cups, is correct.

A post about 5 feet high with a vertical spindle in the top was erected, and on this spindle turned a horizontal arm, carrying at the extremity of its longer portion Robinson's anemometer, and on its shorter portion a counterpoise. The distance from the vertical spindle of the post to the vertical axis of the anemometer was $17^{\text{ft.}}\ 8^{\text{in.}}\cdot 7$. The reading of the dial was taken, and then the arm was made to revolve in the horizontal plane 50 or 100 times, an attendant counting the number of revolutions, and the reading of the dial was again taken. In this manner 1,000 revolutions were made in the direction N.E.S.W.N., and 1,000 revolutions in the direction N.W.S.E.N. In some of the experiments the air was sensibly quiet, and in others there was a little wind; the result was,

For a movement of the instrument through one mile,

Beam revolving N.E.S.W. (opposite to the direction of rotation of the Anemometer-cups)	1·15 was registered.
Beam revolving N.W.S.E. (in the same direction as the Anemometer-cups)	0·97 was registered.

The results from rapid revolutions and from slow revolutions were sensibly the same.

This may be considered as sufficiently confirming the accuracy of the theory.

A new sheet is applied each day at the same time that the sheet of Osler's Anemometer is charged.

§ 21. *Rain Gauges.*

The rain-gauge connected with Osler's anemometer is 50 feet 8 inches above the ground, and 205 feet 6 inches above the mean level of the sea. It exposes to the rain an area of 200 square inches (its horizontal dimensions being 10 by 20 inches).

The collected water passes through a tube into a vessel suspended in a frame by spiral springs, which lengthen as the water accumulates, until 0·25 of an inch is collected in the receiver: it then discharges itself by means of the following modification of the syphon. A copper tube, open at both ends, is fixed in the receiver, in a vertical position, with its end projecting below the bottom. Over the top of this tube a larger tube, closed at the top, is placed loosely. The smaller tube thus forms the longer leg, and the larger tube the shorter leg, of a syphon. The water, having risen to the top of the smaller tube, gradually falls through it into the uppermost portion of a tumbling bucket, fixed in a globe under the receiver. When full, the bucket falls over, throwing the water into a small pipe at the lower part of the globe; the water completely fills the bore of the pipe; its descent causes an imperfect vacuum in the globe, sufficient to cause a draught in the longer leg of the syphon, and the whole contents run off. After leaving the globe, the water is carried away by a waste-pipe attached to the building. The springs at the same time shorten and raise the receiver. The descent and ascent of the water-vessel move a radius-bar which carries a pencil; and this pencil makes a trace upon the paper carried by the sliding board of the self-registering anemometer. As the trace is rather long in proportion to the length of the radius-bar, the bar has now been furnished by Mr. Browning with a "parallel motion," which makes the motion of the pencil sensibly straight.

The scale on the printed paper was adjusted by repeatedly filling the water-vessel until it emptied itself. The weight of the quantity necessary to cause one discharge being thus accurately determined, its bulk was ascertained, and this bulk being divided by the area of the surface of the rain receiver gave the corresponding measure of the scale.

A second gauge, with an area 77 square inches nearly, is placed close to the preceding, the receiving surface of both being on the same horizontal plane.

A third gauge is placed on the roof of the Octagon room, at 38 feet 4 inches above the ground, and 193 feet 2 inches above the mean level of the sea. It is a simple cylinder gauge, 8 inches in diameter and about $50\frac{1}{4}$ square inches in area.

The height of the cylinder is $13\frac{1}{2}$ inches; at the depth of 1 inch from the top within the cylinder is fixed a funnel (an inverted cone) of 6 inches perpendicular height; with the point of this funnel is connected a tube, $\frac{1}{5}$ of an inch in diameter, and $1\frac{1}{2}$ inch in length: $\frac{3}{4}$ of an inch of this tube is slightly curved, and the remaining $\frac{3}{4}$ of an inch is bent upwards, terminating in an aperture of $\frac{1}{8}$ of an inch in diameter. By this arrangement, the last few drops of water remain in the bent part of the tube, and the water is some days evaporating. The upper part of the funnel or bore of the cone is connected with a brass ring, which has been turned in a lathe, and this is connected with a circular piece 6 inches in depth, which passes outside the cylinder, and rests in a water joint, attached to the inner cylinder, and extending all round.

A fourth gauge is placed on the roof of the Magnetic Observatory. Its receiving surface is 21 feet 9 inches above the ground, and 176 feet 7 inches above the mean level of the sea. It is similar in construction to the third gauge, and has been substituted for that placed, until the end of the year 1878, above the Library, the latter having been in some degree overshadowed by the dome of the Great Equatoreal. The elevation of the new gauge is a few inches only less than that of the old gauge.

A fifth gauge is planted on the roof of the Photographic Thermometer shed, 10 feet above the ground, and 164 feet 10 inches above the mean level of the sea. Its construction is the same as that of the third gauge.

A sixth gauge is a self-registering rain-gauge on Crosley's construction, made by Watkins and Hill. The surface exposed to the rain is 100 square inches. The collected water falls into a vibrating bucket, whose receiving concavity is entirely above the center of motion, and which is divided into two equal parts by a partition whose plane passes through the axis of motion. The pipe from the rain-receiver terminates immediately above the axis. Thus that part of the concavity which is highest is always in the position for receiving water from the pipe. When a certain quantity of water has fallen into it, it preponderates, and, falling, discharges its water into a cistern below; then the other part of the concavity receives the rain, and after a time preponderates. Thus the bucket is kept in a state of slow vibration. To its axis is attached an anchor with pallets, which acts upon a toothed wheel by a process exactly the reverse of that of a clock-escapement. This wheel communicates motion to a train of wheels, each of which carries a hand upon a dial-plate; and thus inches, tenths, and hundredths are registered. The gauge is placed on the ground, 21 feet South of the Magnetic Observatory, and 156 feet 6 inches above the mean level of the sea.

The seventh and eighth gauges are placed near together, about 16 feet south of the Magnetic Observatory, 5 inches above the ground, and 155 feet 3 inches above the mean level of the sea. They are similar in construction and area to No. 3. These gauges are sunk about 8 inches in the ground.

All these gauges, except No. 8, are read at 21^h daily; in addition, Crosley's gauge and No. 7 are read daily at 9^h. No. 8 is read at the end of each month only, to check the summation of the daily readings of No. 7. All are read at midnight of the last day of each month.

§ 22. *Electrometer.*

Until the year 1877 the electricity of the atmosphere was collected by means of an insulated exploring wire suspended from the top of the Octagon Room to the top of a pole 79 feet high situated close to the north arm of the Magnetic Observatory; thence the wire was led down the pole and brought into connexion with an insulated receiving bar within the Magnetic Observatory, with which various electrometers and other apparatus could be brought into communication at pleasure. The several annual volumes, until the year 1877, contain detailed descriptions of all these arrangements. The action of this apparatus was frequently unsatisfactory, and its use was altogether discontinued in August of the year 1877, in view of the establishment of a Thomson's self-recording electrometer, received from Mr. White, of Glasgow, in the same year. For a very full description of the principle of this instrument reference may be made to Sir W. Thomson's "Report on Electrometers and Electrostatic Measurements," contained in the *British Association Report* for the year 1867.

It will be sufficient here to give a general description of the instrument which has been planted in the Upper Magnet Room on the slate slab which carries the suspension piece of the Horizontal Force Magnet. A thin flat needle of aluminium, carrying immediately above it a small light mirror, is suspended, on the bifilar principle, by two silk fibres from an insulated support within a large Leyden jar. A little strong sulphuric acid is placed in the bottom of the jar, and from the lower side of the needle depends a platinum wire, kept stretched by a weight, which connects the needle with the sulphuric acid, that is with the inner coating of the jar. A positive charge of electricity being given to the needle and jar, this charge is easily maintained at a constant potential by means of a small electric machine or replenisher forming part of the instrument, and by which the charge can be either increased or decreased at pleasure. A gauge is provided for the purpose of indicating at any moment the amount of charge. The needle hangs within four insulated quadrants, which may be supposed to be formed by cutting a circular flat brass box into quarters, and then slightly separating them. The opposite quadrants are placed in metallic connexion.

The electricity of the atmosphere is collected by means of Sir William Thomson's water-dropping apparatus. For this purpose a rectangular cistern of copper, capable of holding above 30 gallons of water, is placed near the ceiling on the west side of the

south arm of the Upper Magnet Room. The cistern was in the first instance insulated by means of plain ebonite pillars, but this was found not to be sufficiently satisfactory, and in January of the year 1879 pillars of glass, each one encircled and nearly completely inclosed by a glass vessel containing sulphuric acid, were substituted with excellent effect. A pipe passes out from the cistern through the south face of the building, and extends about six feet into the atmosphere, the nozzle from which the water flows being about ten feet above the ground. The water in the cistern is filled up two or three times each day, so that a good and nearly constant water pressure is maintained: it passes from the end of the pipe into the atmosphere through a very small hole, and immediately breaks into drops. A wire leads from the cistern to one of the pairs of electrometer-quadrants already described, the other pair of quadrants being placed in connexion with earth. The water breaking into drops brings the cistern into the same electrical potential as that point of the atmosphere, and this potential is communicated to the pair of quadrants in connexion therewith. The varying potential of the atmosphere thus influences the motions of the within-contained needle, causing it to be deflected from zero in one direction or the other, according as the atmospheric potential is greater or less than that of the earth, that is according as it is positive or negative as respects that of the earth.

The small mirror carried by the needle, as before described, is used for the purpose of obtaining photographic record of the motions of the needle. The light of a gas-lamp falling through a slit upon the mirror is thence reflected, and by means of a plano-convex cylindrical lens is brought to a focus at the surface of a cylinder turned by clock-work, and on which is placed a properly sensitized sheet of paper. Originally one sheet contained the record for 48 hours, but in March of the year 1879 the time of revolution of the cylinder was changed in order to obtain a more extended time scale, each sheet then containing the record for 24 hours only, as is the case with the other registers. The motion of the beam of light being horizontal, the axis of the registering cylinder is also horizontal. A second fixed mirror, by means of the same gas-lamp, causes an invariable reference line to be traced round the cylinder. The actual zero is frequently determined by cutting off communication with the cistern and placing the pairs of quadrants in metallic connexion by means of a small commutator. At each hour the driving-clock shuts off the light from the cylindrical lens for a few minutes, thereby interrupting the trace and giving a time scale. An assistant also occasionally interrupts the light at arbitrary times, as described at page *xvii*, for the other photographic registers.

The instrument was brought into use in the year 1878. But the insulation was frequently defective until the establishment of the sulphuric acid insulators at the beginning of the year 1879, since which period no further difficulty in regard to insulation has been experienced.

In regard to the treatment of the photographic curves, a pencil line was first drawn, representing the general form of the curve, in the same way as for the magnetic registers (page *xxxviii*). Then using a scale of inches, and calling the zero 10·00 (to avoid negative values), the hourly ordinates were measured and entered into a form, in the same way as for the magnetic ordinates, so that mean daily values, and also mean values at every hour in each month, could be determined. The values so found are contained in the tables on pages (lxxi) and (lxxii), and it will be understood that they are simply comparative. All days on which the photographs are good are included, no days being omitted on account of unusual electrical disturbance, it having been found difficult to decide on any limit beyond which it would seem proper to reject the results. At a future time, the more disturbed days may be considered separately in relation to other meteorological elements, taking for discussion together the days selected from several years.

Inconvenience is sometimes caused by cobwebs making connexion between the cistern or its pipe and the walls of the building, and in winter interruptions occasionally occur owing to the freezing of the water in the exit pipe.

§ 23. *Instrument for the Registration of Sunshine.*

The instrument with which the record of duration of sunshine is obtained is one contrived by J. F. Campbell, Esq., and kindly placed by him at the service of the Royal Observatory. It consists of a very accurately formed sphere of glass, nearly 4 inches in diameter, supported concentrically within a well turned hemispherical metal bowl in such a manner that the image of the sun, formed when the sun shines, falls always on the concave surface of the bowl. A strip of some suitable material being fixed in the bowl, the sun, when shining, burns away the material at the points at which the image successively falls, by which means the record of periods of sunshine is obtained. The strip is removed after sunset, and a new one fixed ready for the following day. The material used is blackened millboard. The register is frequently much interrupted, continuous sunshine through a whole day being a comparatively rare occurrence. The place of the meridian is marked on the strip before removing it from the bowl. A series of time scales, suitable for different periods of the year, having been prepared, the proper scale is selected and placed against the record, which is then easily transferred to a sheet of paper specially ruled with equal vertical spaces to represent hours, each sheet containing the record for one calendar month. The daily sums and sums during each hour (reckoning from apparent noon) through the month are thus readily formed.

In 1853

X

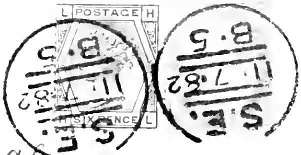
June 12. 1882. Ellis acknowledges receipt of a letter with a sample barrel of asbestos and Emerald green recording temperature as well as duration of sunshine. Scott Wm in July. Spottiswoode Sir W Armstrong. Dr Arthur Mitchell & many others Pictorial Thermometry so published 1882

Campbell 19

uddry Lodge

Camden Hill

Kensington



register is
ter, which
uing hours
e best cir-
indicating
nes faintly
muth and
recording
Magnetic

ed on the
a height
posed is of
ected that
e paper to
degree of
m 0 to 10.
ree of tint
exposure.
the value
hat regis-
h appears
civil day.
ch month

ns.

nmencing

, and the
therefrom
nded upon
tographic

Ellis w
ak mem
other d
I cons
to Lene
and w
degree
In Je
Sir William
... the first
being a second

In regard to tl
drawn, representi
magnetic registers
10·00 (to avoid ne
into a form, in tl
values, and also
The values so fou
will be understood
graphs are good
electrical disturba
which it would s
disturbed days m
elements, taking f
Inconvenience i
cistern or its pi
occasionally occur

The instrument
1853 contrived by J. F.
Royal Observatory
4 inches in diame
metal bowl in such
falls always on the
being fixed in the
at which the imag
shine is obtained.
the following day
X frequently much
comparatively rare
before removing i
periods of the yea
against the record
ruled with equal
record for one e
(reckoning from

Ellis
...ne 12. 1882.
...ith a sample ...
recording temperature as well as duration of
Sunshine. Scott ... in July. Spottiswoode
Sir W Armstrong. Dr Arthur Mitchell & many others
... So published 1882

register is
ter, which
ning hours
e best cir-
indicating
nes faintly
muth and
recording
Magnetic

Ellis wen
all mean
other div
I conser
to Zenith
x and aro
degrees
In Jan

Sir William
made the first
ting a second
J. F. Cl

ed on the
a height
posed is of
ucted that
e paper to
degree of
m 0 to 10.
ree of tint
exposure.
the value
hat regis-
h appears
civil day.
ch month

ms.

mmencing

, and the
therefrom
nded upon
tographic
2

lviii INT

In regar
drawn, rep
magnetic r
10·00 (to a
into a for
values, and
The values
will be und
graphs are
electrical di
which it w
disturbed
elements, ta
Inconven
cistern or
occasionally

BOOK POST.

From The
Astronomer Royal,
Royal Observatory,
Greenwich,
London, S.E.

The instr
contrived b
Royal Obse
4 inches in
metal bowl
falls always
being fixed
at which th
shine is obt
the followi
X frequently
comparativ
before rem
periods of t
against the
ruled with
record for
(reckoning

ne/12. 1882. {
the a sample ben
recording temperature as well as duration of
Sunshine. Scott Who in July. Spottiswoode
Sir W Armstrong. Dr Arthur Mitchell & many others
So published. [illegible]

See the Register at Cannes in 1881 [illegible]

The instrument gives fairly the duration of sunshine, but (usually) no register is obtained at altitudes of less than 5°. Indeed, on fine days the register, which usually has a certain breadth, tapers off in the early morning and late evening hours to a fine point, thus showing the extent to which registration under the best circumstances is effective. The recorded durations are to be understood as indicating the amount of *bright* sunshine, no register being obtained when the sun shines faintly through fog or cloud. In January of the year 1878 degrees of azimuth and altitude were engraved on the metal bowl to facilitate adjustment of the recording strip. The instrument is placed on a table upon the platform above the Magnetic House.

This wanting at manner of other divisions I consented to Zenith distance and azimuth degrees. — In June 1882 Sir William Armstrong who made the first bowl is making a second for J. F. Campbell

§ 24. *Ozonometer.*

The Ozonometer (furnished by Messrs. Horne and Thornthwaite) is fixed on the south-west corner of the roof of the Photographic Thermometer shed, at a height of about 10 feet from the ground. The box in which the papers are exposed is of wood: it is about 8 inches square, and blackened inside, and so constructed that there is free circulation of air through the box, without exposure of the paper to light. The papers are exposed and collected at 21^h, 3^h, and 9^h, and the degree of tint produced is compared with a scale of graduated tints, numbered from 0 to 10. The value of ozone for the civil day is determined by taking the degree of tint obtained at each hour of collection as proportional to the period of exposure. Thus to form the values for any given civil day, three-fourths of the value registered at 21^h, the values registered at 3^h and 9^h, and one-fourth of that registered at the following 21^h, are added together, the resulting sum (which appears in the tables of "Daily Results") being taken as the value referring to the civil day. The means of the 21^h, 3^h, and 9^h values, as observed, are also given for each month in the foot notes.

§ 25. *Explanation of the Tables of Results of the Meteorological Observations.*

The results contained in this section refer generally to the civil day commencing at midnight.

All results throughout the section, so far as relates to the Barometer, and the Temperature of the Air and Evaporation, and to deductions made therefrom (excepting observations of maximum and minimum temperature), are founded upon the photographic records. The form into which the readings from the photographic

sheets were first entered is one having a double argument, the horizontal argument ranging through the 24 hours of the civil day, and the vertical argument through the days of a calendar month. The means of the numbers standing in the vertical columns being then taken, we obtain the mean monthly photographic values of the particular element at each hour of the day, the means of the numbers in the horizontal columns giving the mean daily value. To correct the values for instrumental error it is to be remarked that the standard barometer and the standard dry-bulb and wet-bulb thermometers of the Observatory are read by eye at 21^h, 0^h, 3^h, and 9^h of every day, except on Sundays and a few other days. The comparison of these readings (corrected for temperature in the case of the barometer) with the corresponding readings from the photographs, gives the correction applicable to the photographic readings at those hours. The mean correction at each of these hours being taken through a month, corrections are interpolated for the intermediate hours, which being applied to the corresponding means of the photographic readings, the true value at each hour is obtained. The mean of the twenty-four hourly corrections in each month is adopted as the correction applicable to each mean daily value in the month. Thus mean hourly and mean daily values for the several elements are in each month obtained.

Considering the construction of the photographic barometer (already described), and having regard to the circumstance that the basement temperature is maintained so nearly uniform, the effect produced on the photographic record by changes of temperature is very small, so that the corrections can, without sensible error, be grouped by months in the way described. As regards the dry-bulb and wet-bulb thermometers, the process of correction is equivalent to giving the photographic indications in terms of the standard dry-bulb and wet-bulb thermometers exposed on the free stand.

The mean daily values of the barometer, and of the dry-bulb and wet-bulb thermometers, giving air and evaporation temperatures, found in the way described, are those inserted in the "Daily Results of the Meteorological Observations." The mean hourly values are given in following tables (pages (lx) and (lxi)).

From the mean daily temperatures of the air and of evaporation are deduced, by use of Glaisher's Hygrometrical Tables, the mean daily temperature of the dew-point and degree of humidity. The factors used for calculating the dew-point given in these tables were found by Mr. Glaisher from the comparison of a great number of dew-point determinations, obtained by use of Daniell's hygrometer, with simultaneous observations of dry-bulb and wet-bulb thermometers. The first part of this investigation was published in full, in the volume of *Magnetical and Meteorological Observations* for 1844, pages 67–72; it was based upon all the observations made up to that time. Subsequently, the comparison was extended to include all the simultaneous observa-

tions of these instruments made at the Royal Observatory, Greenwich, from 1841 to 1854, with some observations taken at high temperatures in India, and others at low and medium temperatures at Toronto. The results at the same temperature were found to be the same at these different localities, so far as the climatic circumstances permitted comparison.

The following table exhibits the result of the entire comparison.

TABLE OF FACTORS by which the DIFFERENCE of READINGS of the DRY-BULB and WET-BULB THERMOMETERS is to be MULTIPLIED in order to PRODUCE the DIFFERENCE between the READINGS of the DRY-BULB and DEW-POINT THERMOMETERS.

Reading of Dry-bulb Thermometer.	Factor.	Reading of Dry-bulb Thermometer.	Factor.	Reading of Dry-bulb Thermometer.	Factor.	Reading of Dry-bulb Thermometer.	Factor.
° 10	8·78	° 33	3·01	° 56	1·94	° 79	1·69
11	8·78	34	2·77	57	1·92	80	1·68
12	8·78	35	2·60	58	1·90	81	1·68
13	8·77	36	2·50	59	1·89	82	1·67
14	8·76	37	2·42	60	1·88	83	1·67
15	8·75	38	2·36	61	1·87	84	1·66
16	8·70	39	2·32	62	1·86	85	1·65
17	8·62	40	2·29	63	1·85	86	1·65
18	8·50	41	2·26	64	1·83	87	1·64
19	8·34	42	2·23	65	1 82	88	1·64
20	8·14	43	2·20	66	1·81	89	1·63
21	7·88	44	2·18	67	1·80	90	1·63
22	7·60	45	2·16	68	1·79	91	1·62
23	7·28	46	2·14	69	1·78	92	1·62
24	6·92	47	2·12	70	1·77	93	1·61
25	6·53	48	2·10	71	1·76	94	1·60
26	6·08	49	2·08	72	1·75	95	1·60
27	5·61	50	2·06	73	1·74	96	1·59
28	5·12	51	2·04	74	1·73	97	1·59
29	4·63	52	2·02	75	1·72	98	1·58
30	4·15	53	2·00	76	1·71	99	1·58
31	3·70	54	1·98	77	1·70	100	1·57
32	3·32	55	1·96	78	1·69		

In the same way the mean hourly values of the dew-point and degree of humidity in each month (pages (lxi) and (lxii)) have been calculated from the corresponding mean hourly values of air and evaporation temperatures (pages (lx) and (lxi)).

The excess of the mean temperature of the air on each day above the average of 20 years, given in the "Daily Results," is found by comparing the numbers contained in column 6 with a table of average daily temperatures found by smoothing the numbers given in Table LXXVII. of the "Reduction of Greenwich Meteorological Observations, 1847–1873," which are similarly deduced from photographic records. The smoothed numbers are given in the following table.

SMOOTHED VALUES of the MEAN TEMPERATURE of the AIR as deduced from TWENTY-FOUR HOURLY READINGS on each Day, for every Day of the Year, as obtained from the PHOTOGRAPHIC RECORDS for the Period 1849–1868.

Day of the Month.	January.	February.	March.	April.	May.	June	July.	August.	September.	October.	November.	December.
1	38·1	40·5	40·3	45·3	48·7	57·5	61·6	62·6	60·1	54·7	47·0	41·5
2	37·9	40·6	40·4	45·7	48·9	57·7	61·5	62·7	60·0	54·4	46·7	41·8
3	37·8	40·7	40·5	46·1	49·1	57·9	61·4	62·7	59·8	54·0	46·4	42·1
4	37·7	40·7	40·5	46·4	49·4	58·1	61·4	62·7	59·7	53·7	46·0	42·4
5	37·6	40·6	40·5	46·6	49·7	58·2	61·5	62·7	59·5	53·4	45·6	42·6
6	37·6	40·4	40·5	46·7	50·0	58·3	61·7	62·7	59·3	53·0	45·2	42·7
7	37·6	40·2	40·6	46·8	50·3	58·4	61·9	62·7	59·0	52·7	44·7	42·8
8	37·7	39·9	40·6	46·8	50·6	58·5	62·2	62·7	58·8	52·5	44·3	42·8
9	37·7	39·6	40·7	46·9	50·8	58·5	62·5	62·7	58·5	52·3	43·8	42·8
10	37·8	39·3	40·7	46·9	51·1	58·6	62·7	62·7	58·3	52·1	43·4	42·7
11	37·9	39·1	40·8	47·0	51·4	58·7	62·9	62·7	58·1	51·9	43·0	42·5
12	38·1	38·9	40·8	47·1	51·8	58·8	63·1	62·6	58·0	51·7	42·6	42·2
13	38·2	38·8	40·9	47·2	52·1	58·9	63·3	62·5	57·8	51·6	42·3	41·8
14	38·3	38·7	41·0	47·4	52·5	59·1	63·4	62·4	57·6	51·4	42·0	41·5
15	38·4	38·7	41·1	47·5	52·9	59·3	63·4	62·3	57·4	51·3	41·8	41·1
16	38·5	38·8	41·2	47·6	53·3	59·5	63·5	62·1	57·3	51·2	41·6	40·8
17	38·6	38·9	41·3	47·8	53·7	59·7	63·5	61·9	57·1	51·1	41·5	40·5
18	38·8	39·0	41·4	47·9	54·1	59·9	63·4	61·8	56·9	51·0	41·5	40·2
19	38·9	39·2	41·4	48·0	54·4	60·2	63·3	61·6	56·8	50·8	41·4	40·0
20	39·1	39·3	41·5	48·1	54·7	60·5	63·2	61·4	56·6	50·6	41·3	39·8
21	39·3	39·5	41·6	48·2	55·0	60·8	63·0	61·3	56·4	50·4	41·2	39·6
22	39·5	39·6	41·7	48·2	55·3	61·1	62·9	61·3	56·2	50·1	41·1	39·4
23	39·6	39·7	41·8	48·3	55·5	61·4	62·8	61·2	56·1	49·7	41·0	39·3
24	39·7	39·8	42·0	48·3	55·7	61·7	62·7	61·1	55·9	49·4	41·0	39·3
25	39·8	39·9	42·3	48·4	55·9	61·9	62·7	61·0	55·8	49·1	40·9	39·2
26	39·9	40·0	42·6	48·4	56·1	62·0	62·7	60·9	55·7	48·8	40·8	39·1
27	40·0	40·1	43·0	48·4	56·3	62·0	62·6	60·8	55·5	48·5	40·8	39·0
28	40·1	40·2	43·4	48·5	56·5	61·9	62·6	60·7	55·4	48·2	40·9	38·8
29	40·2		43·8	48·5	56·8	61·8	62·6	60·6	55·2	47·9	41·0	38·7
30	40·3		44·3	48·6	57·0	61·7	62·6	60·4	54·9	47·6	41·2	38·5
31	40·4		44·8		57·3		62·6	60·3		47·3		38·3
Means	38·7	39·7	41·5	47·5	53·1	59·8	62·6	61·9	57·5	51·0	42·7	40·8

The mean of the twelve monthly values is 49°·7.

The daily register of rain contained in column 18 is that recorded by the gauge No. 7, whose receiving surface is 5 inches above the ground. This gauge is usually read at 21^h and 9^h. The continuous record of Osler's self-registering gauge shows whether the amounts measured at 21^h are to be placed to the same, or to the preceding civil day; and in cases in which rain fell both before and after midnight, also gives the means of ascertaining the proper proportion of the 21^h amount which should be placed to each civil day. The number of days of rain given in the foot notes, and in the abstract tables, pages (lix) and (lxxiii), is formed from the records of this gauge. In this numeration only those days are counted on which the fall amounted to or exceeded $0^{in}·005$.

The indications of electricity are derived from Thomson's Electrometer (described in § 22). On some days, not necessary to be specified, during interruption or failure of photographic registration, the results depend on eye observations.

No particular explanation of the anemometric results seems necessary. It may be understood generally that the greatest pressures usually occur in gusts of short duration.

The mean amount of cloud given in a foot note on the right-hand page, and in the abstract table, page (lix), is the mean found from observations made usually at 21^h, 0^h, 3^h, and 9^h, of each day.

For understanding the divisions of time under the headings "Clouds and Weather" and "Electricity," the following remarks are necessary:—In regard to Clouds and Weather, the day is divided by columns into two parts (from midnight to noon, and from noon to midnight), and each of these parts is subdivided into two or three parts by colons (:). Thus, when there is a single colon in the first column, it denotes that the remarks before it apply (roughly) to the interval from midnight to 6 A.M., and those following it to the interval from 6 A.M. to noon. When there are two colons in the first column, it is to be understood that the twelve hours are divided into three nearly equal parts of four hours each. And similarly for the second column. In regard to Electricity the results are included in one column; in this case the colons divide the whole period of 24 hours (midnight to midnight).

The notation employed for Clouds and Weather is as follows, it being understood that for clouds Howard's Nomenclature is used. The figure denotes the proportion of sky covered by cloud, the whole sky being represented by 10.

a	denotes	*aurora borealis*	h	denotes	*haze*
ci	...	*cirrus*	slt-h	...	*slight haze*
ci-cu	...	*cirro-cumulus*	hl	...	*hail*
ci-s	...	*cirro-stratus*	l	...	*lightning*
cu	...	*cumulus*	li-cl	...	*light clouds*
cu-s	...	*cumulo-stratus*	lu-co	...	*lunar corona*
d	...	*dew*	lu-ha	...	*lunar halo*
hy-d	...	*heavy dew*	m	...	*mist*
f	...	*fog*	slt-m	...	*slight mist*
slt-f	...	*slight fog*	n	...	*nimbus*
tk-f	...	*thick fog*	p-cl	...	*partially cloudy*
fr	...	*frost*	r	...	*rain*
ho-fr	...	*hoar frost*	c-r	...	*continued rain*
g	...	*gale*	fr-r	...	*frozen rain*
hy-g	...	*heavy gale*	fq-r	...	*frequent rain*
glm	...	*gloom*	hy-r	...	*heavy rain*
gt-glm	...	*great gloom*	c-hy-r	...	*continued heavy rain*

m-r	denotes *misty rain*	sc	denotes *scud*
fq-m-r	... *frequent misty rain*	li-sc	... *light scud*
oc-m-r	... *occasional misty rain*	sl	... *sleet*
oc-r	... *occasional rain*	sn	... *snow*
sh-r	... *shower of rain*	oc-sn	... *occasional snow*
shs-r	... *showers of rain*	slt-sn	... *slight snow*
slt-r	... *slight rain*	so-ha	... *solar halo*
oc-slt-r	... *occasional slight rain*	sq	... *squall*
th-r	... *thin rain*	sqs	... *squalls*
fq-th-r	... *frequent thin rain*	fq-sqs	... *frequent squalls*
oc-th-r	... *occasional thin rain*	hy-sqs	... *heavy squalls*
hy-sh	... *heavy shower*	fq-hy-sqs	... *frequent heavy squalls*
slt-sh	... *slight shower*	oc-sqs	... *occasional squalls*
fq-shs	... *frequent showers*	t	... *thunder*
hy-shs	... *heavy showers*	t-sm	... *thunder storm*
fq-hy-shs	... *frequent heavy showers*	th-cl	... *thin clouds*
oc-hy-shs	... *occasional heavy showers*	v	... *variable*
li-shs	... *light showers*	vv	... *very variable*
oc-shs	... *occasional showers*	w	... *wind*
s	... *stratus*	st-w	... *strong wind*

The following is the notation employed for Electricity:—

N	denotes *negative*	w	denotes *weak*
P	... *positive*	s	... *strong*
m	... *moderate*	v	... *variable*

The duplication of the letter denotes an intensity of the modification described, thus, s s, is very strong; v v, very variable. 0 indicates no electricity, and a dash "—" accidental failure of the apparatus.

The remaining columns in the tables of "Daily Results" seem to require no special remark; all necessary explanation regarding the results therein contained will be found in the notes at the foot of the left-hand page, or in the descriptions of the several instruments given in preceding sections.

In regard to the comparisons of the extremes and means, &c. of meteorological elements with average values, contained in the foot notes, it may be mentioned that the photographic barometric results are compared with the corresponding barometric results, 1854–1873, and the photographic thermometric results and deductions therefrom with the corresponding thermometric results, 1849–1868 (see "Reduction of Greenwich Meteorological Observations 1847–1873"). Other deductions, from eye observations, are compared with averages for the period 1841–1879.

The tables of Meteorological Abstracts, following the Tables of "Daily Results," require in general no special explanation.

§ 26. *Observations of Luminous Meteors.*

In arranging for the observations of meteors, the directions circulated by the Committee of the British Association have received careful attention. On the nights specially mentioned in the directions systematic watch has been kept whenever the weather was sufficiently favourable. These nights are, January 2, and 15 to 19; February 10 and 19; March 1 to 4 and 18; April 20, and 25 to 30; May 18; June 6 and 20; July 17, 20, and 29; August 3 and 7 to 13 (especially August 10); September 10; October 1 to 6 and 16 to 23; November 12 to 14, 19, 28, and 30; December 6 to 14 (especially December 11) and December 24.

The observers in the year 1880 were Mr. Ellis, Mr. Nash, Mr. Hugo, Mr. Simmons, Mr. McClellan, Mr. Jeffery, and Mr. Sanders. Their observations are distinguished by the initials E., N., H., S., M., J., and W. J. S., respectively. One observation with the initials E. W. M. was made by Mr. Maunder.

§ 27. *Details of the Chemical Operations for the Photographic Records.*

The paper used in 1880 was that known as Whatman's royal, a paper not specially prepared for photographic purposes.

First Operation.—Preliminary Preparation of the Paper.

The chemical solutions used in this process are the following :—

(1.) Sixteen grains of Iodide of Potassium are dissolved in one ounce of distilled water.

(2.) Twenty-four grains of Bromide of Potassium are dissolved in one ounce of distilled water.

(3.) When the crystals are dissolved, the two solutions are mixed together, forming the bromo-iodising solution. The mixture will keep through any length of time. Immediately before use, it is filtered through filtering paper.

A quantity of the paper, sufficient for the consumption of several weeks, is treated in the following manner, sheet after sheet.

> The sheet of paper is pinned by its four corners to a horizontal board. Upon the paper, a sufficient quantity (about 50 minims, or $\frac{5}{48}$ of an ounce troy) of the bromo-iodising solution is applied, by pouring it upon the paper in front of a glass rod, which is then moved to and fro till the whole surface is uniformly wetted by the solution. Or, the solution may be evenly distributed by means of a camel-hair brush.

The paper thus prepared is allowed to remain in a horizontal position for a few minutes, and is then hung up to dry in the air; when dry, it is placed in a drawer, and may be kept through any length of time.

Second Operation.—Rendering the Paper sensitive to the Action of Light.

A solution of Nitrate of Silver is prepared by dissolving 50 grains of crystallized Nitrate of Silver in one ounce of distilled water. Since the magnetic basement has been used for photography, 15 minims of Acetic Acid have always been added to the solution.

Then the following operation is performed in a room illuminated by yellow light.

The paper is pinned upon a board somewhat smaller than itself, and by means of a glass rod its surface is wetted with 70 minims of the Nitrate of Silver solution. It is allowed to remain a short time in a horizontal position, and, if any part of the paper still shines from the presence of a part of the solution unabsorbed into its texture, the superfluous fluid is taken off by the application of blotting paper.

The paper, still damp, is immediately placed upon the cylinder, and is covered by the exterior glass tube, and the cylinder is mounted upon the revolving apparatus, to receive the spot of light formed by the mirror, which is carried by the magnet; or to receive the line of light passing through the thermometer tube.

Third Operation.—Development of the Photographic Trace.

When the paper is removed from the cylinder, it is placed as before upon a board, and a saturated solution of Gallic Acid, to which a few drops of Aceto-Nitrate of Silver are occasionally added, is spread over the paper by means of a glass rod, and this action is continued until the trace is fully developed. The solutions are kept in the magnetic basement, and are always used at the temperature of that room. When the trace is well developed, the paper is placed in a vessel with water, and repeatedly washed with several changes of water; a brush being passed lightly over both sides of the paper to remove any crystalline deposit.

Fourth Operation.—Fixing the Photographic Trace.

The Photograph is placed in a solution of Hyposulphite of Soda, made by dissolving four or five ounces of the Hyposulphite in a pint of water; it is plunged completely in the liquid, and allowed to remain from one to two hours, until the yellow tint of the Iodide of Silver is removed. After this the sheet is washed

repeatedly with water, allowed to remain immersed in water for 24 hours, and afterwards placed within folds of cotton cloths till nearly dry. Finally it is either ironed, or placed between sheets of blotting-paper and pressed.

§ 28. *Personal Establishment.*

The personal establishment during the year 1880 consisted of William Ellis, Superintendent of the Magnetical and Meteorological Department, and William Carpenter Nash, Assistant.

Three or four computers have usually been attached to the Department.

Royal Observatory, Greenwich,
1881, December 8.

W. H. M. CHRISTIE.

ROYAL OBSERVATORY, GREENWICH.

RESULTS

OF

MAGNETICAL OBSERVATIONS.

1880.

1.

ROYAL OBSERVATORY, GREENWICH.

REDUCTION

OF THE

MAGNETIC OBSERVATIONS

(EXCLUDING THE DAYS OF GREAT MAGNETIC DISTURBANCE).

1880.

TABLE I.—MEAN WESTERN DECLINATION of the MAGNET on each ASTRONOMICAL DAY, as deduced from the MEAN of TWENTY-FOUR HOURLY MEASURES of ORDINATES of the PHOTOGRAPHIC REGISTER on that DAY.

1880.

Day of the Month	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	18°	18°	18°	18°	18°	18°	18°	18°	18°	18°	18°	18°
1	34·9	35·1	34·7	33·6	30·9	32·1	32·1	32·5	33·0	32·1	31·3	31·1
2	35·1	35·2	34·4	33·2	33·3	31·6	31·8	33·6	33·1	31·9	30·8	31·2
3	34·9	35·1	34·4	33·7	32·2	31·3	31·7	33·5	32·9	32·0	..	30·2
4	35·0	35·2	34·5	34·4	32·1	31·4	31·9	33·3	33·0	31·5	31·4	30·9
5	34·9	35·2	34·9	34·0	31·8	31·2	32·6	33·1	33·5	31·1	..	30·3
6	34·6	35·1	34·2	33·7	32·1	31·6	32·2	32·5	33·3	32·2	..	30·7
7	34·8	35·1	35·8	33·4	32·1	32·5	32·1	32·4	33·5	31·8	..	30·4
8	35·1	34·6	34·1	33·5	32·5	32·2	31·8	32·4	33·1	32·5	..	30·6
9	34·5	34·8	33·8	33·7	32·7	31·7	31·7	33·2	32·4	32·4	..	30·4
10	34·4	34·8	34·3	33·8	32·7	31·9	31·8	33·1	32·4	32·7	..	29·4
11	34·5	33·5	34·4	33·8	32·4	31·8	32·0	34·5	31·7	32·9	..	31·3
12	34·5	34·6	34·7	33·7	31·8	32·0	32·7	..	32·0	32·3	..	30·5
13	34·7	34·7	33·9	33·7	32·0	31·7	31·6	..	31·4	32·4	..	30·7
14	34·9	35·0	34·2	33·7	31·7	31·3	32·8	30·9	32·1	32·1	..	30·6
15	34·9	35·0	34·1	33·4	33·4	32·0	32·1	31·7	31·6	32·1	..	30·3
16	34·8	35·2	34·2	34·2	32·1	32·5	32·0	32·7	32·4	30·8	31·1	30·6
17	35·0	35·4	33·0	33·1	32·2	31·5	32·1	31·8	31·7	31·6	31·3	30·4
18	35·0	34·8	34·5	32·5	32·3	31·6	31·8	34·7	31·7	31·9	31·0	30·7
19	34·4	35·0	33·7	34·3	32·3	31·4	29·8	32·8	31·6	32·4	31·0	30·6
20	34·6	34·8	34·1	33·8	31·9	31·5	32·2	32·8	31·8	32·2	30·6	30·8
21	34·6	34·9	33·8	33·3	33·0	32·0	31·9	32·0	30·9	30·3	30·3	30·8
22	34·6	34·5	34·1	33·2	31·8	32·2	31·5	32·1	32·2	32·1	30·8	30·4
23	35·4	34·5	33·9	32·8	32·0	31·2	31·9	32·4	31·2	30·8	30·8	30·6
24	34·5	34·9	34·0	33·7	32·2	31·8	32·0	32·2	31·6	32·2	30·9	31·1
25	34·9	34·7	33·9	33·4	32·1	31·8	31·3	32·0	32·1	30·6	30·8	30·8
26	34·7	34·6	33·9	33·1	32·9	32·0	31·9	32·0	31·8	32·1	31·2	30·7
27	34·7	34·0	33·1	32·8	32·6	32·1	32·3	31·8	33·3	32·8	31·0	30·2
28	34·5	34·4	33·9	33·5	31·7	31·9	32·9	32·2	33·0	32·6	31·0	31·6
29	33·7	34·2	33·6	33·7	32·2	31·7	32·5	32·0	31·9	31·9	30·6	30·8
30	34·5		33·5	32·9	32·2	31·5	32·4	31·4	31·8	34·3	30·3	31·1
31	34·5		33·9		31·6		32·6	32·7		33·0		31·2

TABLE II.—MEAN MONTHLY DETERMINATION of the WESTERN DECLINATION of the MAGNET at every HOUR of the DAY; obtained by taking the MEAN of all the DETERMINATIONS at the same HOUR of the DAY through the MONTH.

1880.

Hour, Greenwich Mean Solar Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
h	18°	18°	18°	18°	18°	18°	18°	18°	18°	18°	18°	18°
0	36·8	37·4	37·8	38·2	36·4	36·4	36·5	38·1	37·7	37·3	34·3	33·5
1	37·4	38·3	39·1	39·7	37·4	37·1	37·7	39·2	38·7	38·4	34·6	33·4
2	37·0	38·1	39·[illegible]	39·4	37·1	37·2	37·7	39·0	37·9	37·5	33·6	33·1
3	36·1	37·0	37·9	38·1	36·3	35·3	36·7	37·5	36·4	35·2	32·5	32·3
4	35·5	35·8	36·2	36·5	35·1	34·9	35·4	35·8	34·3	33·3	31·4	31·6
5	35·1	35·3	35·1	34·9	34·0	33·5	33·9	34·0	33·2	32·0	30·7	30·9
6	34·7	35·1	33·9	33·9	33·1	32·6	33·1	32·6	32·5	31·8	30·6	30·3
7	34·4	34·7	33·6	33·1	32·4	31·9	32·7	31·8	32·1	31·1	29·8	29·7
8	33·8	34·3	33·3	32·8	32·0	31·5	32·1	31·2	31·4	30·5	29·2	29·1
9	33·4	34·[illegible]	32·9	32·5	31·5	31·5	31·4	31·4	31·4	30·2	28·9	28·7
10	33·4	33·6	32·4	32·4	31·1	31·2	30·9	31·1	31·2	30·1	28·7	28·6
11	33·4	33·4	32·2	32·5	31·1	31·2	30·7	30·9	30·8	29·6	28·9	28·9
12	33·7	33·4	32·9	32·5	31·2	30·9	30·7	30·3	30·5	30·0	29·0	29·0
13	34·0	33·6	33·1	32·4	31·4	30·7	30·5	30·2	30·6	30·3	29·8	29·7
14	34·3	33·9	33·4	32·3	31·2	30·4	30·1	30·4	30·5	30·7	30·1	30·2
15	34·4	34·2	33·3	32·1	30·6	30·3	29·7	30·5	30·1	31·1	30·7	30·3
16	34·5	34·3	33·3	32·0	30·2	29·9	29·7	30·2	30·3	30·9	31·0	30·3
17	34·4	34·2	33·1	31·8	30·0	28·5	28·8	29·8	30·5	31·0	31·0	30·6
18	34·4	34·1	33·3	31·2	29·2	27·7	28·6	29·6	30·3	30·9	30·9	30·5
19	34·2	33·8	32·7	30·1	28·3	27·3	28·1	29·6	29·2	30·4	31·0	30·6
20	34·1	33·2	31·5	29·2	28·4	27·5	28·2	29·8	28·6	29·6	30·5	30·6
21	33·8	33·0	31·1	29·5	29·5	28·7	29·2	30·4	29·4	29·9	30·2	30·7
22	34·5	34·2	32·5	32·0	31·5	31·0	31·4	32·6	31·8	32·3	31·3	31·3
23	35·7	35·8	35·2	35·2	34·2	34·1	34·0	35·6	35·3	35·2	33·0	32·1

TABLE III.

1880.

Month.	MEAN WESTERN DECLINATION of the MAGNET IN EACH MONTH.	EXCESS OF WESTERN DECLINATION above 18°, converted into WESTERLY FORCE, and expressed in terms of GAUSS'S UNIT measured on the METRICAL SYSTEM.	MONTHLY MEANS of all the DIURNAL RANGES of the WESTERN DECLINATION, as deduced from the Twenty-four Hourly Measures of each day.
	° ′		′
January	18. 34·7	0·01821	4·9
February	18. 34·8	·01826	6·1
March	18. 34·1	·01750	9·6
April	18. 33·5	·01738	11·2
May	18. 32·2	·01690	10·7
June	18. 31·8	·01669	11·0
July	18. 32·0	·01679	11·0
August	18. 32·6	·01711	12·5
September	18. 32·3	·01695	11·5
October	18. 32·1	·01685	11·7
November	18. 30·9	·01622	7·9
December	18. 30·7	·01611	6·8
Mean	18. 32·6	0·01713	9·6

The unit adopted in column 3 is the Millimètre-Milligramme-Second Unit. To express the forces on the Centimètre-Gramme-Second (C.G.S.) system, the numbers must be divided by 10, equivalent to shifting the decimal point one step towards the left.

TABLE IV.—MEAN HORIZONTAL MAGNETIC FORCE, expressed in terms of the Mean Horizontal Force for the Year, and diminished by a Constant (0·86000 nearly), uncorrected for TEMPERATURE, on each ASTRONOMICAL DAY; as deduced from the MEAN of TWENTY-FOUR HOURLY MEASURES of ORDINATES of the PHOTOGRAPHIC REGISTER on that DAY.

1880.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d												
1	0·13005	0·12928	0·12934	0·12985	0·12948	0·13028	0·12989	0·12975	0·12789	0·13000	0·12976	0·13065
2	·13006	·12943	·12951	·12931	·12861	·13052	·13009	·12988	·12821	·12977	·13038	·13097
3	·13017	·12910	·12920	·12920	·12915	·13080	·13000	·12989	·12821	·13033	..	·13053
4	·12973	·12917	·12929	·12942	·12925	·13033	·13001	·12966	·12815	·13078	·12929	·13083
5	·12960	·12975	·12924	·12895	·12970	·13005	·12994	·12941	·12813	·13094	..	·13048
6	·12995	·12910	·12936	·12910	·12977	·13002	·13000	·12916	·12884	·13050	..	·13103
7	·12945	·12933	·12923	·12927	·12962	·13016	·13060	·12985	·12904	·13003	..	·13068
8	·12921	·12919	·12937	·12930	·12967	·12976	·13079	·12974	·12921	·12999	..	·13093
9	·12930	·12962	·12908	·12948	·13004	·13023	·13028	·12946	·12987	·13041	..	·13139
10	·12960	·12943	·12903	·12964	·13023	·13008	·13028	·12935	·12936	·13028	..	·13129
11	·12975	·12940	·12954	·12967	·13001	·13054	·12980	·12837	·12960	·12995	..	·13016
12	·12976	·12922	·12921	·12990	·12985	·13016	·12994	..	·13001	·13018	..	·13089
13	·12981	·12927	·12840	·12982	·12950	·12987	·12950	..	·12958	·13008	..	·13025
14	·12974	·12951	·12884	·12988	·13001	·12997	·12893	·12773	·13021	·12997	..	·13070
15	·13013	·12944	·12896	·12990	·12924	·13035	·12911	·12823	·12876	·13049	..	·13116
16	·12997	·12945	·12946	·12987	·12999	·13031	·12903	·12831	·12932	·13007	·12849	·13125
17	·12968	·12917	·12714	·12949	·13027	·12959	·12934	·12805	·12933	·13007	·12639	·13130
18	·13005	·12936	·12808	·12972	·13031	·12943	·12958	·12800	·12960	·12995	·12839	·13112
19	·13041	·12975	·12886	·12878	·13050	·13003	·12901	·12667	·12970	·13010	·12784	·12956
20	·13039	·12925	·12890	·12939	·12988	·12992	·12877	·12735	·12981	·13072	·12588	·13003
21	·13020	·12922	·12890	·12953	·12985	·12970	·12937	·12717	·12996	·13017	·12565	·13051
22	·13029	·12922	·12863	·12937	·13000	·13020	·12898	·12751	·12970	·13045	·12647	·13126
23	·12965	·12945	·12899	·12969	·13021	·12947	·12924	·12820	·12993	·12955	·12458	·13105
24	·12973	·12969	·12912	·13014	·13012	·12872	·12937	·12870	·13013	·13022	·12492	·13135
25	·13004	·12960	·12900	·12937	·13000	·12919	·12882	·12903	·13006	·12938	·12526	·13193
26	·13044	·12943	·12921	·12980	·12941	·12986	·13008	·12795	·12997	·12951	·13175	·13187
27	·12983	·12952	·12928	·13018	·12925	·12919	·12909	·12815	·12910	·12958	·13123	·13123
28	·12992	·12956	·12949	·12913	·12988	·12925	·12977	·12821	·12925	·12885	·13173	·13138
29	·12935	·12945	·12937	·12967	·13018	·12933	·12959	·12814	·12927	·12985	·13145	·13095
30	·12977		·12955	·12968	·13007	·12935	·12964	·12825	·12999	·13000	·13070	..
31	·12938		·12986		·12975		·12972	·12839		·12894		..

TABLE V.—DAILY MEANS of READINGS (usually eight on each Day) of the THERMOMETER placed within the box inclosing the HORIZONTAL FORCE MAGNETOMETER, for each ASTRONOMICAL DAY.

1880.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	61·7	60·5	61·8	62·9	62·4	63·4	67·8	65·8	71·3	65·2	61·4	62·5
2	60·3	61·3	61·6	63·0	62·4	63·3	66·3	65·5	72·6	64·0	60·8	61·3
3	60·5	62·0	62·8	63·9	63·0	62·4	66·5	66·9	73·3	60·6	..	62·0
4	60·6	60·2	63·0	63·1	63·5	61·3	65·8	69·2	74·2	61·6	60·5	63·5
5	60·3	59·6	63·9	62·2	63·0	61·6	66·8	70·1	73·3	65·4	..	63·1
6	60·1	61·3	63·5	62·1	62·7	62·7	65·9	69·2	70·7	65·9	..	64·0
7	60·0	62·2	62·6	62·4	63·0	63·0	65·3	67·2	69·0	66·3	..	64·3
8	60·2	61·2	62·2	62·5	62·3	62·5	64·7	66·4	68·6	65·5	..	63·7
9	61·2	60·4	63·6	61·6	61·9	62·3	64·7	67·6	69·0	65·3	..	63·0
10	60·9	60·4	63·4	61·4	62·9	63·0	66·0	69·7	70·7	64·8	..	62·3
11	59·6	58·8	62·3	61·7	63·4	63·0	66·8	70·9	69·9	64·8	..	62·9
12	60·1	60·3	63·2	62·0	64·1	64·0	67·5	..	68·1	64·1	..	64·1
13	60·3	60·7	62·6	63·4	65·2	65·8	67·7	..	66·8	65·1	..	63·5
14	60·4	61·1	60·9	63·0	66·1	66·5	68·9	70·4	65·8	64·3	..	62·3
15	61·3	61·6	61·6	61·9	65·7	65·2	69·8	70·2	65·1	63·9	..	62·1
16	61·7	62·4	61·6	62·1	63·6	65·3	70·1	70·2	65·4	64·8	62·3	61·9
17	60·4	62·7	61·7	63·3	62·2	66·6	69·5	71·3	65·8	65·1	61·4	61·1
18	58·0	62·6	62·3	63·8	61·6	67·6	69·2	71·1	64·1	65·2	60·3	62·1
19	56·6	63·1	62·1	65·2	62·9	67·5	69·1	72·0	63·0	63·9	61·1	62·3
20	55·8	63·0	61·8	64·3	65·5	67·2	70·1	72·4	63·2	61·5	59·5	62·1
21	57·1	62·7	61·7	63·3	66·0	67·1	70·2	72·3	65·1	61·2	58·8	61·2
22	58·8	61·4	61·6	62·8	65·2	66·3	69·1	70·7	68·0	61·3	58·8	62·1
23	59·4	60·4	61·2	63·0	64·2	66·3	69·7	69·1	67·9	61·3	60·8	63·3
24	60·0	59·5	61·5	63·6	64·9	67·4	69·2	69·5	67·7	61·0	62·3	61·4
25	58·5	60·7	62·2	63·1	66·3	67·0	70·4	70·6	67·6	61·8	62·9	58·2
26	56·9	61·1	62·0	61·6	67·7	65·8	69·9	71·6	68·5	62·7	63·2	58·0
27	56·4	61·2	62·3	61·6	66·6	67·7	70·1	71·0	68·2	64·5	62·2	61·5
28	56·5	62·3	62·0	62·2	63·4	68·6	69·6	71·3	66·7	64·3	62·0	63·8
29	56·8	62·7	62·5	61·8	63·0	68·7	69·1	71·2	65·5	62·0	62·3	62·6
30	59·0		63·1	61·9	63·1	68·7	66·7	70·8	64·5	60·6	62·1	..
31	60·2		63·0		63·0		66·3	70·9		61·7		..

TABLE VI.—MEAN MONTHLY DETERMINATION of the HORIZONTAL MAGNETIC FORCE, expressed in terms of the Mean Horizontal Force for the Year, and diminished by a Constant (0·86000 nearly), uncorrected for TEMPERATURE, at every HOUR of the DAY; obtained by taking the MEAN of all the DETERMINATIONS at the same HOUR of the DAY through each MONTH.

1880.

Hour, Greenwich Mean Solar Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
h												
0	0·12973	0·12903	0·12859	0·12864	0·12918	0·12923	0·12850	0·12766	0·12831	0·12911	0·12796	0·13071
1	·12995	·12920	·12887	·12908	·12940	·12940	·12874	·12792	·12869	·12955	·12811	·13076
2	·13005	·12946	·12907	·12954	·12972	·12973	·12911	·12836	·12891	·12987	·12833	·13085
3	·12997	·12951	·12918	·12987	·13008	·12997	·12967	·12870	·12905	·13007	·12828	·13087
4	·12990	·12948	·12910	·12999	·13020	·13008	·12985	·12886	·12919	·13016	·12814	·13082
5	·12982	·12946	·12913	·13001	·13046	·13025	·12999	·12891	·12930	·13023	·12816	·13078
6	·12980	·12946	·12909	·12999	·13065	·13044	·13027	·12905	·12961	·13032	·12827	·13078
7	·12977	·12947	·12909	·12990	·13054	·13058	·13033	·12922	·12979	·13043	·12827	·13085
8	·12965	·12948	·12918	·12991	·13035	·13060	·13025	·12916	·12990	·13041	·12836	·13080
9	·12964	·12944	·12932	·13000	·13025	·13043	·13018	·12904	·12992	·13037	·12839	·13086
10	·12967	·12942	·12940	·12999	·13015	·13031	·13005	·12896	·12990	·13048	·12841	·13085
11	·12967	·12937	·12939	·12992	·13006	·13024	·13001	·12897	·12987	·13048	·12846	·13082
12	·12967	·12931	·12930	·12991	·13000	·13019	·13001	·12894	·12982	·13042	·12841	·13091
13	·12974	·12939	·12920	·12982	·13000	·13013	·13006	·12898	·12989	·13037	·12837	·13087
14	·12980	·12943	·12914	·12967	·13008	·13013	·13010	·12896	·12988	·13036	·12839	·13091
15	·12983	·12943	·12917	·12966	·12997	·13015	·13008	·12894	·12986	·13042	·12845	·13098
16	·12990	·12951	·12927	·12965	·12988	·13015	·13003	·12901	·12985	·13044	·12859	·13106
17	·13002	·12960	·12938	·12974	·12978	·13007	·12994	·12893	·12983	·13049	·12877	·13121
18	·13011	·12966	·12937	·12969	·12959	·12987	·12975	·12873	·12974	·13045	·12887	·13135
19	·13016	·12961	·12928	·12957	·12937	·12955	·12952	·12838	·12943	·13021	·12879	·13122
20	·13019	·12952	·12909	·12928	·12902	·12919	·12916	·12793	·12889	·12969	·12859	·13123
21	·13001	·12923	·12864	·12879	·12875	·12890	·12871	·12751	·12842	·12911	·12823	·13108
22	·12973	·12902	·12829	·12835	·12876	·12884	·12843	·12726	·12802	·12873	·12794	·13085
23	·12966	·12892	·12830	·12824	·12895	·12889	·12843	·12733	·12807	·12867	·12767	·13069

TABLE VII.—MONTHLY MEANS of READINGS of the THERMOMETER placed within the box inclosing the HORIZONTAL FORCE MAGNETOMETER, at each of the ordinary Hours of Observation.

1880.

Hour, Greenwich Mean Solar Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
h	°	°	°	°	°	°	°	°	°	°	°	°
0	59·2	61·1	62·1	62·5	63·7	65·1	68·0	69·6	67·9	63·4	61·2	62·2
1	59·3	61·2	62·2	62·6	63·9	65·3	68·3	69·9	68·2	63·5	61·4	62·3
2	59·5	61·4	62·3	62·7	64·1	65·5	68·8	70·3	68·5	63·6	61·5	62·4
3	59·6	61·4	62·4	62·8	64·3	65·7	69·0	70·6	68·7	63·8	61·6	62·5
9	60·1	61·8	62·8	63·3	64·7	66·1	68·9	71·1	68·8	64·0	61·5	62·5
21	59·1	61·2	62·3	62·7	63·5	64·6	66·7	68·8	67·0	63·4	61·0	62·1
22	59·1	61·1	62·2	62·5	63·4	64·8	67·1	69·0	67·3	63·3	61·0	62·1
23	59·0	61·1	62·1	62·4	63·5	65·0	67·5	69·4	67·5	63·3	61·0	62·1

TABLE VIII.

1880.

Month.	MEAN HORIZONTAL MAGNETIC FORCE in EACH MONTH, uncorrected for TEMPERATURE. Expressed in terms of the MEAN HORIZONTAL FORCE for the Year, and diminished by a Constant (0·86000 nearly).	MEAN HORIZONTAL MAGNETIC FORCE in EACH MONTH, uncorrected for TEMPERATURE. Expressed in terms of GAUSS'S UNIT measured on the METRICAL SYSTEM, and diminished by a Constant (1·55144 nearly).	Mean Temperature.
			°
January	0·12985	0·23425	59·4
February..................	·12959	·23342	61·3
March	·12908	·23286	62·3
April	·12955	·23371	62·7
May.......................	·12980	·23416	63·9
June	·12989	·23432	65·3
July......................	·12963	·23385	68·0
August	·12857	·23194	69·8
September	·12934	·23333	68·0
October	·13004	·23459	63·5
November..................	·12834	·23153	61·3
December	·13092	·23618	62·3

The unit adopted in column 3 is the Millimètre-Milligramme-Second Unit. To express the forces on the Centimètre-Gramme-Second (C.G.S.) system, the numbers must be divided by 10, equivalent to shifting the decimal point one step towards the left.

The value 0·86000 of Horizontal Force corresponds to 1·55144 of Gauss's Unit on the Metrical (Millimètre-Milligramme-Second) system, and to 0·15514 on the C.G.S. system.

TABLE IX.—MEAN VERTICAL MAGNETIC FORCE, expressed in terms of the Mean Vertical Force for the Year, and diminished by a Constant (0·96000 nearly), uncorrected for TEMPERATURE, on each ASTRONOMICAL DAY; as deduced from the MEAN of TWENTY-FOUR HOURLY MEASURES of ORDINATES of the PHOTOGRAPHIC REGISTER on that DAY.

1880.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d												
1	0·04358	0·04148	0·04165	0·04175	0·04147	0·04183	0·04573	0·04402	0·04787	0·04204	0·03734	0·03771
2	·04159	·04174	·04138	·04258	·04196	·04207	·04457	·04397	·04888	·04077	·03639	·03595
3	·04281	·04251	·04260	·04354	·04232	·04142	·04443	·04511	·04925	·03786	..	·03692
4	·04285	·04095	·04328	·04268	·04298	·04104	·04384	·04663	·05037	·03780	·03628	·03789
5	·04232	·04005	·04395	·04188	·04227	·04100	·04470	·04738	·04968	·04145	·03669	·03773
6	·04181	·04163	·04321	·04175	·04223	·04160	·04410	·04658	·04753	·04159	·03760	·03837
7	·04175	·04241	·04290	·04216	·04223	·04205	·04350	·04500	·04551	·04247	·03816	·03852
8	·04210	·04122	·04206	·04209	·04184	·04171	·04252	·04426	·04504	·04160	·03747	·03787
9	·04261	·04049	·04366	·04114	·04134	·04152	·04261	·04481	·04519	·04108	·03671	·03744
10	·04253	·04108	·04358	·04096	·04183	·04237	·04400	·04645	·04715	·04049	·03870	·03737

TABLE IX.—MEAN VERTICAL MAGNETIC FORCE, expressed in terms of the Mean Vertical Force for the Year, &c.—*concluded.*

1880.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d												
11	0·04140	0·04008	0·04242	0·04147	0·04268	0·04203	0·04480	0·04787	0·04603	0·04055	0·03948	0·03788
12	·04142	·04096	·04325	·04169	·04291	·04305	·04470	..	·04429	·03983	·03928	·03826
13	·04147	·04133	·04262	·04268	·04407	·04427	·04476	..	·04252	·04059	·03985	·03799
14	·04146	·04128	·04122	·04233	·04453	·04503	·04634	·04756	·04171	·03995	·03922	·03676
15	·04237	·04191	·04165	·04156	·04483	·04343	·04706	·04707	·04167	·03924	·03828	·03670
16	·04310	·04272	·04159	·04191	·04325	·04364	·04789	·04710	·04208	·04042	·03741	·03618
17	·04143	·04262	·04216	·04295	·04192	·04495	·04773	·04781	·04237	·04054	·03673	·03539
18	·03951	·04266	·04228	·04299	·04176	·04610	·04681	·04742	·04086	·04054	·03571	·03650
19	·03825	·04288	·04229	·04465	..	·04582	·04654	·04910	·04013	·03929	·03642	·03694
20	·03767	·04312	·04161	·04372	·04398	·04544	·04747	·04882	·03987	·03666	·03567	·03653
21	·03902	·04303	·04103	·04274	·04473	·04586	·04776	·04862	·04118	·03657	·03541	·03570
22	·04003	·04169	·04119	·04271	·04363	·04502	·04704	·04717	·04351	·03693	·03488	·03624
23	·04030	·04123	·04087	·04271	·04260	·04500	·04710	·04586	·04401	·03675	·03664	·03714
24	·04067	·04030	·04118	·04297	·04352	·04660	·04664	·04632	·04358	·03656	·03757	·03588
25	·03903	·04112	·04163	·04265	·04442	·04560	·04782	·04685	·04362	·03781	·03774	·03391
26	·03753	·04104	·04133	·04100	·04637	·04414	·04738	·04842	·04466	·03839	·03812	·03442
27	·03732	·04098	·04217	·04094	·04559	·04553	·04804	·04775	·04428	·04053	·03745	·03640
28	·03743	·04253	·04172	·04202	·04261	·04664	·04767	·04846	·04375	·04033	·03749	·03733
29	·03790	·04312	·04157	·04107	·04204	·04660	·04701	·04810	·04234	·03783	·03769	·03614
30	·03999		·04218	·04119	·04205	·04685	·04492	·04741	·04136	·03683	·03723	·03401
31	·04091		·04178		·04186		·04445	·04757		·03773		..

TABLE X.—DAILY MEANS of READINGS (usually eight on each Day) of the THERMOMETER placed within the box inclosing the VERTICAL FORCE MAGNETOMETER, for each ASTRONOMICAL DAY.

1880.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	60·5	60·8	61·6	62·3	62·6	63·2	66·7	66·0	70·7	65·3	61·5	62·5
2	59·3	61·3	61·4	62·8	62·2	63·4	65·5	66·0	72·0	64·2	60·8	61·1
3	60·6	61·9	62·3	63·8	63·0	62·7	65·4	67·3	72·5	60·8	..	61·9
4	60·7	60·7	62·8	63·2	63·6	61·5	64·8	68·7	73·2	61·5	60·4	63·1
5	60·2	59·7	63·6	62·1	63·2	61·3	65·8	69·4	72·4	64·8	60·9	62·7
6	60·1	61·2	63·1	62·1	62·9	62·2	65·4	68·6	70·1	65·7	62·0	63·4
7	59·9	62·1	62·4	62·5	62·9	62·6	65·2	66·5	68·7	66·0	62·4	63·5
8	60·3	60·9	62·0	62·5	62·5	62·3	63·9	66·0	68·3	65·3	62·2	63·2
9	61·0	60·1	63·2	61·4	62·0	62·2	64·0	66·9	68·8	64·8	61·2	62·7
10	61·0	60·1	63·2	61·7	63·0	63·0	65·4	68·7	70·5	64·0	63·5	62·3
11	60·2	58·8	62·1	61·9	63·6	62·9	66·3	69·9	69·5	64·0	64·2	62·6
12	60·4	60·6	63·1	62·5	64·0	63·9	66·5	..	67·2	63·5	64·1	63·4
13	60·2	60·9	62·2	63·4	65·3	65·5	66·7	..	65·7	64·3	64·6	63·1
14	60·1	61·0	60·6	63·1	66·0	65·9	68·1	69·7	64·8	63·6	63·6	62·1
15	61·4	61·7	61·4	62·1	66·0	64·6	69·1	69·2	64·4	63·2	63·2	62·1
16	61·9	62·4	61·7	62·3	63·9	65·0	69·2	69·1	65·1	64·2	62·0	61·3
17	60·4	62·6	61·7	63·4	62·7	66·1	69·0	70·1	65·4	64·3	61·3	60·6
18	58·4	62·4	62·2	63·6	62·5	67·0	68·2	69·9	64·2	64·5	60·7	61·6
19	57·1	62·6	62·1	65·1	..	66·9	68·3	70·6	62·7	62·9	60·9	62·1
20	56·4	62·6	61·7	64·3	65·5	66·6	69·3	71·0	62·9	60·4	59·8	61·7
21	57·6	62·5	61·3	63·3	66·0	66·8	69·5	71·0	64·4	60·2	59·8	61·1
22	59·1	61·2	61·4	63·0	64·9	66·0	68·8	69·5	66·6	60·7	59·6	61·7
23	59·6	59·9	61·0	63·1	64·1	66·0	69·0	68·3	67·3	60·8	61·6	62·9
24	59·9	59·5	61·6	63·7	64·7	67·0	68·8	68·8	67·2	60·5	62·9	60·9
25	58·3	60·8	62·0	63·1	66·0	66·5	70·0	69·7	67·3	61·8	63·1	59·2
26	56·6	60·7	61·6	61·3	67·8	65·3	69·4	70·8	68·4	62·8	63·1	60·0
27	56·1	60·7	62·5	61·7	67·1	66·6	69·7	70·2	68·0	64·7	62·2	62·3
28	56·4	62·4	62·2	62·7	63·8	67·6	69·6	70·9	67·1	64·2	62·2	63·2
29	57·2	62·9	62·3	62·1	63·2	67·8	68·9	70·7	65·9	61·9	62·6	61·8
30	59·4		62·6	61·9	63·0	67·7	66·7	70·4	64·9	60·6	62·3	60·6
31	60·2		62·5		63·0		66·2	70·6		61·8		..

TABLE XI.—MEAN MONTHLY DETERMINATION of the VERTICAL MAGNETIC FORCE, expressed in terms of the Mean Vertical Force for the Year, and diminished by a Constant (0·96000 nearly), uncorrected for TEMPERATURE, at every HOUR of the DAY; obtained by taking the MEAN of all the DETERMINATIONS at the same HOUR of the DAY through each MONTH.

1880.

Hour, Greenwich Mean Solar Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
h												
0	0·04019	0·04117	0·04149	0·04146	0·04229	0·04331	0·04533	0·04628	0·04395	0·03889	0·03707	0·03656
1	·04042	·04136	·04175	·04169	·04266	·04364	·04580	·04668	·04435	·03916	·03732	·03684
2	·04069	·04157	·04201	·04195	·04300	·04399	·04624	·04712	·04472	·03943	·03754	·03705
3	·04087	·04175	·04221	·04216	·04325	·04421	·04655	·04749	·04507	·03966	·03768	·03713
4	·04095	·04182	·04239	·04234	·04352	·04443	·04675	·04778	·04527	·03977	·03775	·03716
5	·04112	·04188	·04252	·04255	·04374	·04463	·04687	·04794	·04531	·03984	·03779	·03717
6	·04121	·04202	·04261	·04264	·04381	·04471	·04697	·04803	·04525	·03988	·03775	·03712
7	·04120	·04207	·04271	·04266	·04378	·04473	·04695	·04802	·04521	·03990	·03770	·03708
8	·04117	·04202	·04266	·04274	·04375	·04467	·04683	·04795	·04516	·03985	·03763	·03699
9	·04116	·04195	·04251	·04269	·04364	·04459	·04670	·04780	·04502	·03974	·03749	·03691
10	·04106	·04187	·04239	·04261	·04348	·04444	·04642	·04756	·04481	·03962	·03742	·03686
11	·04104	·04187	·04240	·04264	·04340	·04431	·04614	·04729	·04464	·03960	·03744	·03686
12	·04098	·04185	·04239	·04261	·04331	·04416	·04593	·04707	·04450	·03957	·03745	·03680
13	·04091	·04181	·04235	·04253	·04318	·04401	·04574	·04685	·04433	·03952	·03741	·03674
14	·04083	·04174	·04226	·04244	·04296	·04386	·04551	·04662	·04412	·03944	·03735	·03668
15	·04075	·04170	·04217	·04233	·04282	·04374	·04532	·04644	·04395	·03937	·03731	·03666
16	·04066	·04163	·04208	·04224	·04272	·04366	·04518	·04626	·04381	·03928	·03725	·03663
17	·04058	·04157	·04198	·04216	·04264	·04354	·04502	·04612	·04370	·03919	·03717	·03656
18	·04047	·04150	·04191	·04209	·04255	·04344	·04486	·04602	·04361	·03913	·03711	·03652
19	·04043	·04153	·04196	·04203	·04247	·04340	·04477	·04593	·04353	·03909	·03709	·03648
20	·04031	·04148	·04188	·04193	·04239	·04334	·04477	·04589	·04349	·03906	·03710	·03643
21	·04018	·04136	·04165	·04179	·04231	·04326	·04478	·04588	·04344	·03895	·03709	·03641
22	·04003	·04121	·04147	·04157	·04214	·04324	·04485	·04598	·04346	·03873	·03696	·03637
23	·03995	·04110	·04134	·04136	·04206	·04326	·04499	·04610	·04352	·03865	·03693	·03634

TABLE XII.—MONTHLY MEANS of READINGS of the THERMOMETER placed within the box inclosing the VERTICAL FORCE MAGNETOMETER, at each of the ordinary Hours of Observation.

1880.

Hour, Greenwich Mean Solar Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
h	°	°	°	°	°	°	°	°	°	°	°	°
0	59·3	61·1	62·0	62·7	64·0	64·8	67·5	69·0	67·6	63·1	62·0	62·0
1	59·5	61·2	62·2	62·8	64·2	65·0	67·8	69·3	67·9	63·3	62·2	62·3
2	59·6	61·4	62·3	62·9	64·4	65·2	68·1	69·6	68·2	63·4	62·2	62·3
3	59·7	61·5	62·4	62·9	64·5	65·2	68·2	69·7	68·3	63·5	62·4	62·3
9	60·0	61·7	62·6	63·3	64·6	65·4	67·8	69·9	68·0	63·5	62·1	62·0
21	59·0	61·0	61·8	62·6	63·5	64·3	66·2	68·2	66·6	62·8	61·8	61·7
22	59·0	60·9	61·7	62·4	63·5	64·5	66·6	68·4	66·8	62·8	61·8	61·7
23	58·9	60·9	61·8	62·4	63·6	64·6	67·0	68·8	67·0	62·8	61·8	61·8

TABLE XIII.

1880.

Month.	Mean Vertical Magnetic Force in each Month, uncorrected for Temperature. Expressed in terms of the Mean Vertical Force for the Year, and diminished by a Constant (0·96000 nearly).	Mean Vertical Magnetic Force in each Month, uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System, and diminished by a Constant (4·20045 nearly).	Mean Temperature.
			°
January	0·04071	0·17812	59·4
February	·04166	·18228	61·2
March	·04213	·18434	62·1
April	·04222	·18473	62·7
May	·042[illegible]9	·18810	64·0
June	·04394	·19226	64·9
July	·04580	·20039	67·4
August	·04688	·20512	69·1
September	·04434	·19401	67·5
October	·03939	·17235	63·1
November	·03737	·16351	62·0
December	·03676	·16084	62·0

The unit adopted in column 3 is the Millimètre-Milligramme-Second Unit. To express the forces on the Centimètre-Gramme-Second (C.G.S.) system, the numbers must be divided by 10, equivalent to shifting the decimal point one step towards the left.

The value 0·96000 of Vertical Force corresponds to 4·20043 of Gauss's Unit on the Metrical (Millimètre-Milligramme-Second) system, and to 0·42004 on the C.G.S. system.

TABLE XIV.—MEAN, through the Range of Months, of the MONTHLY MEAN DETERMINATIONS of the DIURNAL INEQUALITIES of DECLINATION, HORIZONTAL FORCE, and VERTICAL FORCE, for the Year 1880.

(The Results for Horizontal Force and Vertical Force are not corrected for Temperature.)

January to December.

Hour, Greenwich Mean Solar Time.	Inequality of Declination.	Equivalent in terms of Gauss's Unit measured on the Metrical System.	Inequality of Horizontal Force.	Equivalent in terms of Gauss's Unit measured on the Metrical System.	Inequality of Vertical Force.	Equivalent in terms of Gauss's Unit measured on the Metrical System.
h	′					
0	+ 4·06	+ 0·00213	− 0·00065	− 0·00117	− 0·00052	− 0·00228
1	+ 4·94	+ 259	− 39	− 70	− 21	− 92
2	+ 4·58	+ 240	− 12	− 22	+ 9	+ 39
3	+ 3·38	+ 177	+ 7	+ 13	+ 32	+ 140
4	+ 2·01	+ 105	+ 11	+ 20	+ 48	+ 210
5	+ 0·91	+ 48	+ 18	+ 32	+ 60	+ 263
6	+ 0·21	+ 11	+ 28	+ 51	+ 65	+ 284
7	− 0·37	− 19	+ 32	+ 58	+ 65	+ 284
8	− 0·88	− 46	+ 30	+ 54	+ 61	+ 267
9	− 1·16	− 61	+ 29	+ 52	+ 50	+ 219
10	− 1·42	− 75	+ 27	+ 49	+ 36	+ 158
11	− 1·51	− 79	+ 24	+ 43	+ 29	+ 127
12	− 1·47	− 77	+ 21	+ 38	+ 20	+ 88
13	− 1·28	− 67	+ 20	+ 36	+ 10	+ 44
14	− 1·18	− 62	+ 20	+ 36	− 3	− 13
15	− 1·20	− 63	+ 21	+ 38	− 14	− 61
16	− 1·26	− 66	+ 24	+ 43	− 23	− 101
17	− 1·50	− 79	+ 28	+ 51	− 33	− 144
18	− 1·75	− 92	+ 23	+ 41	− 42	− 184
19	− 2·20	− 115	+ 6	+ 11	− 46	− 201
20	− 2·54	− 133	− 22	− 40	− 51	− 223
21	− 2·19	− 115	− 59	− 106	− 59	− 258
22	− 0·44	− 23	− 85	− 153	− 68	− 298
23	+ 1·98	+ 104	− 88	− 159	− 72	− 315

Hour, Greenwich Mean Solar Time.	Mean Readings of Thermometers. Horizontal Force.	Vertical Force.
h	°	°
0	63·84	63·75
1	64·01	63·98
2	64·21	64·13
3	64·37	64·21
9	64·62	64·23
21	63·53	63·28
22	63·58	63·33
23	63·65	63·46

The unit adopted in columns 3, 5, and 7 is the Millimètre-Milligramme-Second Unit. To express the inequalities on the Centimètre-Gramme-Second (C.G.S.) system, the numbers must be divided by 10, equivalent to shifting the decimal point one step towards the left.

ROYAL OBSERVATORY, GREENWICH.

INDICATIONS

OF

MAGNETOMETERS

ON SIX DAYS OF MAGNETIC DISTURBANCE: THREE BEING DAYS OF GREAT DISTURBANCE.

1880.

Greenwich Mean Solar Time.	Western Declination.	Excess of Western Declination above 18°, converted into Westerly Force, and expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 10 h m	° ′ ″	
20. 0	18. 29. 50	·0156
20. 40	29. 30	·0155
20. 45	30. 0	·0157
21. 10	29. 50	·0156
22. 0	31. 0	·0163
22. 15	31. 20	·0165
22. 18	27. 10	·0143
22. 25	30. 30	·0160
23. 0	35. 0	·0184
23. 5	33. 50	·0177
23. 8	36. 0	·0189
23. 12	34. 30	·0181
23. 17	36. 50	·0193
23. 19	33. 30	·0176
23. 23	35. 30	·0187
23. 27	34. 50	·0182
23. 33	38. 30	·0202
23. 39	35. 0	·0184
23. 44	38. 40	·0202
23. 51	36. 50	·0193
Aug. 11		
0. 0	18. 40. 20	·0212
0. 25	46. 0	·0241
0. 31	44. 0	·0231
0. 42	45. 30	·0239
0. 51	44. 10	·0232
1. 0	45. 0	·0236
1. 13	42. 30	·0223
1. 30	45. 10	·0237
1. 40	45. 0	·0236
1. 52	47. 0	·0247
1. 58	45. 0	·0236
2. 5	46. 0	·0241
2. 12	43. 30	·0229
2. 27	43. 20	·0228
2. 39	48. 50	·0256
2. 51	44. 0	·0231
3. 5	45. 20	·0238
3. 21	43. 30	·0229
3. 35	43. 30	·0229
3. 49	43. 0	·0226
4. 9	44. 30	·0234
4. 20	43. 30	·0229
4. 39	43. 0	·0226
4. 46	44. 0	·0231
5. 19	37. 10	·0195
5. 26	37. 20	·0196
5. 38	35. 10	·0185
5. 51	35. 0	·0184
6. 4	34. 0	·0178
6. 11	33. 50	·0177
6. 29	18. 36. 50	·0193
6. 40	35. 10	·0185
6. 49	37. 0	·0194
6. 55	34. 10	·0179
7. 30	32. 30	·0171
7. 47	36. 30	·0192
7. 54	32. 10	·0169
8. 2	31. 30	·0166
8. 20	34. 0	·0178
8. 44	22. 40	·0118
9. 6	44. 0	·0231
9. 32	32. 0	·0168
9. 40	32. 30	·0171
9. 52	27. 0	·0142
10. 10	30. 0	·0157
10. 19	28. 20	·0149
10. 30	27. 50	·0146
10. 43	31. 20	·0165
10. 58	28. 0	·0147
11. 8	31. 40	·0166
11. 15	37. 40	·0197
11. 20	33. 0	·0173
11. 29	31. 0	·0163
11. 40	22. 10	·0116
11. 45	23. 0	·0121
11. 57	19. 50	·0104
12. 10	24. 0	·0126
12. 19	24. 40	·0129
12. 30	27. 30	·0145
12. 37	26. 20	·0138
12. 55	28. 0	·0147
13. 5	29. 20	·0154
13. 15	29. 20	·0154
13. 23	30. 40	·0160
13. 36	30. 10	·0158
13. 48	31. 20	·0165
14. 7	31. 10	·0164
14. 17	30. 50	·0161
14. 54	31. 0	·0163
16. 16	31. 0	·0163
16. 29	30. 30	·0160
16. 35	32. 0	·0168
16. 40	30. 20	·0159
16. 50	31. 30	·0166
16. 58	30. 40	·0160
17. 5	31. 30	·0166
17. 20	30. 0	·0157
17. 35	29. 10	·0153
17. 42	30. 40	·0160
17. 50	29. 0	·0152
18. 0	29. 0	·0152
18. 7	29. 50	·0156

Greenwich Mean Solar Time.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Horizontal Force.	Expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 10 h m		
20. 0	·1294	·2334
21. 4	·1286	·2320
22. 10	·1279	·2307
22. 20	·1280	·2309
22. 30	·1298	·2341
22. 36	·1294	·2334
22. 40	·1300	·2345
22. 47	·1292	·2331
22. 52	·1300	·2345
22. 59	·1290	·2327
23. 2	·1295	·2336
23. 7	·1285	·2318
23. 11	·1302	·2349
23. 20	·1285	·2318
23. 25	·1298	·2341
23. 40	·1242	·2241
23. 48	·1262	·2277
23. 52	·1253	·2260
Aug. 11		
0. 4	·1264	·2280
0. 20	·1290	·2327
0. 30	·1278	·2305
0. 35	·1291	·2329
0. 39	·1287	·2322
0. 50	·1306	·2356
0. 55	·1291	·2329
1. 2	·1287	·2322
1. 6	·1268	·2287
1. 14	·1262	·2277
1. 25	·1270	·2291
1. 35	·1278	·2305
1. 43	·1288	·2323
1. 55	·1307	·2358
2. 4	·1305	·2354
2. 18	·1284	·2316
2. 22	·1292	·2331
2. 30	·1276	·2302
2. 38	·1321	·2383
2. 48	·1301	·2347
2. 57	·1289	·2325
3. 9	·1294	·2334
3. 20	·1292	·2331
3. 33	·1291	·2329
3. 41	·1298	·2341
4. 10	·1316	·2374
4. 36	·1299	·2343
4. 44	·1302	·2349
4. 57	·1286	·2320
5. 12	·1276	·2302
5. 22	·1281	·2211
5. 31	·1278	·2305
5. 43	·1292	·2331
5. 52	·1292	·2331
5. 59	·1298	·2341
6. 13	·1302	·2349
6. 23	·1307	·2358
6. 36	·1298	·2341
6. 45	·1300	·2345
6. 56	·1282	·2313
7. 2	·1286	·2320
7. 18	·1281	·2311
7. 35	·1291	·2329
7. 55	·1276	·2302
8. 10	·1290	·2327
8. 20	·1291	·2329
8. 32	·1292	·2331
8. 35	·1302	·2349
8. 39	·1298	·2341
8. 49	·1326	·2392
9. 0	·1314	·2370
9. 9	·1285	·2318
9. 22	·1266	·2284
9. 39	·1289	·2325
9. 49	·1286	·2320
10. 0	·1294	·2334
10. 12	·1280	·2309
10. 33	·1286	·2320
10. 54	·1260	·2273
11. 12	·1318	·2377
11. 20	·1302	·2349
11. 26	·1310	·2363
11. 38	·1300	·2345
11. 41	·1306	·2356
11. 53	·1284	·2316
12. 3	·1290	·2327
12. 35	·1261	·2275
13. 0	·1274	·2298
13. 12	·1272	·2295
13. 19	·1279	·2307
13. 30	·1273	·2296
13. 40	·1275	·2300
	***	
14. 23	·1280	·2309
	***	
16. 13	·1281	·2311
16. 20	·1284	·2316
16. 25	·1278	·2305
16. 32	·1288	·2323
16. 40	·1279	·2307
16. 49	·1283	·2314
16. 56	·1278	·2305

Greenwich Mean Solar Time.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Vertical Force.	Expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 10 h m		
20. 0	·0459	·2008
20. 48	·0459	·2008
21. 48	·0461	·2017
22. 16	·0463	·2026
22. 30	·0462	·2022
23. 34	·0463	·2026
Aug. 11		
0. 0	·0466	·2039
0. 39	·0472	·2065
0. 49	·0472	·2065
1. 49	·0480	·2100
2. 15	·0479	·2095
2. 40	·0484	·2118
2. 52	·0482	·2109
3. 10	·0484	·2118
3. 50	·0487	·2131
4. 14	·0490	·2144
4. 24	·0489	·2139
4. 35	·0492	·2153
4. 52	·0492	·2153
5. 44	·0498	·2179
6. 30	·0501	·2192
6. 51	·0501	·2192
7. 25	·0501	·2192
7. 53	·0499	·2183
8. 10	·0500	·2188
8. 40	·0496	·2170
8. 50	·0495	·2166
9. 0	·0493	·2157
9. 16	·0487	·2131
9. 37	·0489	·2139
9. 49	·0488	·2135
10. 2	·0487	·2131
10. 33	·0485	·2122
10. 53	·0482	·2109
11. 1	·0484	·2118
11. 19	·0475	·2078
11. 29	·0472	·2065
11. 49	·0474	·2074
12. 5	·0476	·2082
12. 30	·0476	·2082
12. 47	·0477	·2087
13. 48	·0476	·2082
14. 43	·0474	·2074
17. 50	·0468	·2048
19. 24	·0466	·2039
19. 48	·0466	·2039
20. 2	·0465	·2035
20. 50	·0466	·2039
21. 54	·0467	·2044
22. 45	·0467	·2044
23. 0	·0466	·2039
23. 31	·0468	·2048
23. 40	·0464	·2031
23. 59	·0466	·2039

The indications are taken from the sheets of the Photographic Record. The Symbol *** denotes that the magnet has been generally in a state of slight agitation, and the Symbol (†) that the register has failed between the preceding and following readings.

For the Horizontal and Vertical Forces, increasing readings denote increasing forces.

The constant by which the values of Horizontal Force are diminished is 0·8600 nearly, as expressed in parts of the whole Horizontal Force, equivalent to 1·5514 in terms of Gauss's Unit measured on the Metrical (Millimètre-Milligramme-Second) system. The corresponding constant for Vertical Force is 0·9600 nearly, equivalent to 4·2004 in terms of Gauss's Unit. To express the Metrical measures on the C.G.S. (Centimètre-Gramme-Second) system, the numbers must be divided by 10, equivalent to shifting the decimal point one step towards the left.

The measures of Horizontal Force on August 12 until 4^h are somewhat uncertain, on account of faintness of the photographic trace.

Greenwich Mean Solar Time.	Western Declination.	Excess of Western Declination above 18°, converted into Westerly Force, and expressed in terms of Gauss's Unit measured on the Metrical System.	Greenwich Mean Solar Time.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Horizontal Force.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System.	Greenwich Mean Solar Time.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Vertical Force.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 11			Aug. 11					
h m	° ′ ″		h m			h m		
18. 32	18. 28. 30	·0150	17. 5	·1284	·2316			
18. 40	29. 20	·0154	17. 19	·1279	·2307			
18. 46	28. 0	·0147	17. 28	·1286	·2320			
18. 53	30. 0	·0157	17. 30	·1276	·2302			
19. 3	28. 50	·0151	17. 40	·1286	·2320			
19. 15	30. 40	·0160	17. 44	·1280	·2309			
19. 28	30. 40	·0160	17. 58	·1280	·2309			
19. 38	32. 20	·0170		* * *				
20. 5	30. 10	·0158	18. 43	·1277	·2304			
20. 23	33. 30	·0176	18. 55	·1280	·2309			
20. 31	32. 50	·0172	19. 8	·1272	·2295			
20. 35	34. 10	·0179	19. 24	·1265	·2282			
20. 55	31. 50	·0167	19. 52	·1271	·2293			
21. 1	33. 10	·0174	20. 30	·1268	·2287			
21. 10	31. 40	·0166	20. 40	·1271	·2293			
21. 30	31. 30	·0166	20. 50	·1270	·2291			
21. 53	32. 30	·0171	20. 59	·1277	·2304			
22. 33	36. 0	·0189	21. 8	·1270	·2291			
22. 48	35. 40	·0187	21. 12	·1278	·2305			
23. 0	35. 30	·0187	21. 30	·1276	·2302			
23. 9	37. 40	·0197	21. 45	·1278	·2305			
23. 12	35. 10	·0185	22. 30	·1281	·2311			
23. 18	37. 30	·0197	22. 51	·1276	·2302			
23. 32	39. 0	·0205	23. 7	·1268	·2287			
23. 39	31. 10	·0164	23. 12	·1256	·2266			
23. 43	40. 0	·0210	23. 18	·1261	·2275			
23. 52	33. 10	·0174	23. 24	·1256	·2266			
23. 59	27. 20	·0144	23. 30	·1262	·2277			
			23. 40	·1217	·2196			
			23. 45	·1247	·2250			
				(†)				
Aug. 12			Aug. 12			Aug. 12		
0. 2	18. 24. 0	·0126	0. 0	·1230	·2219	0. 0	·0466	·2039
0. 8	33. 0	·0173	0. 2	·1207	·2178	0. 8	·0472	·2065
0. 10	31. 0	·0163	0. 8	·1257	·2268	0. 15	·0469	·2052
0. 14	37. 10	·0195	0. 11	·1188	·2143	0. 20	·0474	·2074
0. 20	8. 50	·0046	0. 15	·1217	·2196	0. 28	·0473	·2069
0. 28	28. 0	·0147		(†)		0. 35	·0495	·2166
0. 30	37. 0	·0194	0. 35	·1220	·2201	0. 40	·0486	·2126
0. 35	34. 30	·0181	0. 40	·1200	·2165	0. 47	·0493	·2157
0. 38	43. 0	·0226	1. 3	·1308	·2359		(†)	
0. 43	37. 0	·0194	1. 12	·1232	·2223	1. 50	·0487	·2131
0. 48	44. 0	·0231	1. 28	·1295	·2336	2. 48	·0508	·2223
0. 50	42. 10	·0221	1. 42	·1248	·2251	2. 51	·0508	·2223
0. 53	48. 40	·0255	1. 53	·1283	·2314	3. 0	·0514	·2249
0. 58	47. 30	·0250	2. 7	·1248	·2251	3. 5	·0511	·2235
1. 2	56. 20	·0296	2. 12	·1312	·2367	3. 10	·0515	·2253
1. 7	50. 0	·0262	2. 22	·1250	·2255	3. 13	·0513	·2244
1. 13	53. 0	·0278		(†)		3. 22	·0522	·2284
1. 15	45. 30	·0239	2. 30	·1254	·2262	3. 28	·0520	·2275
1. 25	47. 30	·0250	2. 38	·1324	·2388	3. 38	·0528	·2310

Greenwich Mean Solar Time.	Western Declination.	Excess of Western Declination above 18°, converted into Westerly Force, and expressed in terms of Gauss's Unit measured on the Metrical System.	Greenwich Mean Solar Time.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Horizontal Force.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System.	Greenwich Mean Solar Time.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Vertical Force.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 12			Aug. 12			Aug. 12		
h m	° ′ ″		h m			h m		
1. 30	18. 52. 15	·0274	2. 42	·1295	·2336	3. 43	·0528	·2310
1. 32	50. 0	·0262	2. 46	·1333	·2404	3. 48	·0534	·2337
1. 40	54. 35	·0286	2. 48	·1273	·2296	3. 53	·0530	·2319
1. 50	50. 30	·0265	3. 3	·1333	·2404	3. 58	·0533	·2332
1. 58	58. 30	·0307	3. 8	·1293	·2332	4. 9	·0523	·2288
2. 2	18. 48. 30	·0255	3. 13	·1361	·2455	4. 11	·0526	·2301
2. 16	19. 1. 25	·0322	3. 20	·1331	·2401	4. 29	·0526	·2301
2. 20	18. 55. 30	·0292	3. 22	·1353	·2440	4. 57	·0528	·2310
2. 25	57. 15	·0300	3. 28	·1259	·2271	5. 25	·0519	·2270
2. 29	50. 0	·0262	3. 32	·1336	·2410	5. 40	·0517	·2262
2. 32	50. 50	·0266	3. 46	·1250	·2255	5. 47	·0518	·2266
2. 36	47. 0	·0247	3. 51	·1345	·2426	5. 55	·0514	·2249
2. 44	58. 30	·0307	3. 58	·1249	·2253	6. 33	·0510	·2231
2. 46	18. 57. 20	·0301	4. 3	·1299	·2343	6. 40	·0511	·2235
2. 48	19. 0. 0	·0315	4. 8	·1232	·2223	6. 48	·0509	·2227
2. 53	18. 54. 25	·0285	4. 14	·1277	·2304	6. 55	·0508	·2223
2. 56	57. 0	·0299	4. 17	·1252	·2259	7. 0	·0509	·2227
2. 58	47. 55	·0252	4. 24	·1264	·2280	7. 6	·0507	·2219
3. 3	50. 25	·0264	4. 29	·1243	·2242	7. 16	·0504	·2206
3. 5	43. 50	·0230	4. 37	·1261	·2275	7. 24	·0508	·2223
3. 8	47. 5	·0247	4. 42	·1247	·2250	7. 52	·0493	·2157
3. 10	43. 0	·0226	4. 45	·1266	·2284	8. 1	·0495	·2166
3. 12	46. 30	·0244	4. 55	·1246	·2248	8. 19	·0487	·2131
3. 15	18. 46. 15	·0242	5. 3	·1257	·2268	8. 55	·0488	·2135
3. 21	19. 5. 40	·0344	5. 10	·1268	·2287	9. 9	·0484	·2118
3. 28	18. 51. 0	·0268	5. 18	·1250	·2255	9. 28	·0484	·2118
3. 32	58. 0	·0304	5. 24	·1257	·2268	9. 41	·0480	·2100
3. 35	47. 30	·0250	5. 30	·1244	·2244	9. 50	·0481	·2104
3. 37	52. 50	·0277	5. 40	·1247	·2250	10. 15	·0473	·2069
3. 43	40. 40	·0213	5. 42	·1237	·2232	10. 22	·0473	·2069
3. 47	54. 0	·0283	5. 53	·1262	·2277	10. 28	·0463	·2026
3. 50	44. 55	·0236	5. 57	·1244	·2244	10. 34	·0467	·2044
3. 55	53. 25	·0280	6. 2	·1253	·2260	10. 50	·0461	·2017
4. 4	33. 55	·0178	6. 5	·1248	·2251	11. 8	·0466	·2039
4. 10	41. 0	·0215	6. 20	·1257	·2268	11. 18	·0463	·2026
4. 21	46. 0	·0241	6. 27	·1252	·2259	11. 50	·0449	·1964
4. 28	44. 5	·0231	6. 37	·1258	·2269	12. 2	·0447	·1956
4. 40	48. 45	·0256	6. 46	·1278	·2305	12. 25	·0451	·1973
4. 45	47. 30	·0250	6. 52	·1262	·2277	12. 41	·0457	·2000
4. 56	37. 30	·0197	6. 56	·1273	·2296	12. 50	·0457	·2000
5. 5	42. 35	·0223	7. 0	·1254	·2262	13. 0	·0459	·2008
5. 13	40. 40	·0213	7. 3	·1269	·2289	13. 12	·0458	·2004
5. 20	44. 5	·0231	7. 12	·1256	·2266	13. 20	·0458	·2004
5. 29	41. 55	·0220	7. 16	·1266	·2284	13. 30	·0460	·2013
5. 35	42. 5	·0220	7. 20	·1245	·2246	13. 45	·0458	·2004
5. 40	41. 0	·0215	7. 22	·1265	·2282	14. 8	·0451	·1973
5. 48	43. 40	·0229	7. 25	·1249	·2253	14. 13	·0452	·1978
5. 54	38. 25	·0201	7. 38	1347	·2430	14. 32	·0447	·1956
6. 12	39. 10	·0206	7. 42	·1320	·2381	14. 49	·0453	·1982
6. 24	38. 0	·0199	7. 46	·1325	·2390	15. 26	·0453	·1982
6. 28	39. 30	·0208	7. 55	·1282	·2313	15. 37	·0451	·1973
6. 33	37. 20	·0196	8. 5	·1332	·2403	16. 47	·0456	·1995

Greenwich Mean Solar Time.	Readings of Thermometers. Of H.F. Magnet.	Readings of Thermometers. Of V.F. Magnet.	Greenwich Mean Solar Time.	Readings of Thermometers. Of H.F. Magnet.	Readings of Thermometers. Of V.F. Magnet.	Greenwich Mean Solar Time.	Readings of Thermometers. Of H.F. Magnet.	Readings of Thermometers. Of V.F. Magnet.	Greenwich Mean Solar Time.	Readings of Thermometers. Of H.F. Magnet.	Readings of Thermometers. Of V.F. Magnet.	Greenwich Mean Solar Time.	Readings of Thermometers. Of H.F. Magnet.	Readings of Thermometers. Of V.F. Magnet.
Aug. 10			Aug. 11			Aug. 11			Aug. 12			Aug. 12		
h m	°	°	h m	°	°	h m	°	°	h m	°	°	h m	°	°
21. 0	69·0	68·1	0. 0	70·4	69·5	9. 0	73·0	71·2	0. 0	70·4	69·8	9. 0	71·8	70·6
22. 0	69·6	68·7	1. 0	71·1	70·3	21. 0	69·6	68·5	1. 0	70·7	70·2	21. 0	69·8	68·7
23. 0	69·9	69·2	2. 0	71·5	70·6	22. 0	69·9	68·8	2. 0	71·4	70·4	22. 0	70·0	69·0
			3. 0	71·9	70·8	23. 0	70·0	69·1	3. 0	71·6	70·6	23. 0	70·0	69·1

Greenwich Mean Solar Time.	Western Declination.	Excess of Western Declination above 18°, converted into Westerly Force, and expressed in terms of Gauss's Unit measured on the Metrical System.	Greenwich Mean Solar Time.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Horizontal Force.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System.	Greenwich Mean Solar Time.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Vertical Force.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 12			Aug. 12			Aug. 12		
h m	° ′ ″		h m			h m		
6. 43	18. 40. 30	·0214	8. 22	·1240	·2237	17. 6	·0456	·1995
6. 46	38. 25	·0201	8. 30	·1258	·2269	17. 14	·0455	·1991
6. 50	42. 0	·0220	8. 46	·1280	·2309	18. 0	·0460	·2013
6. 55	36. 20	·0191	9. 0	·1300	·2345	18. 20	·0459	·2008
7. 3	40. 50	·0214	9. 16	·1260	·2273	18. 48	·0460	·2013
7. 5	36. 55	·0194	9. 22	·1258	·2269	19. 16	·0461	·2017
7. 10	39. 30	·0208	9. 32	·1268	·2287	19. 48	·0464	·2031
7. 29	0. 0	·0000	9. 46	·1244	·2244	20. 48	·0467	·2044
7. 36	28. 30	·0150	9. 58	·1256	·2266	21. 27	·0469	·2052
7. 43	26. 40	·0139	10. 10	·1240	·2237	22. 10	·0472	·2065
7. 48	34. 50	·0182	10. 15	·1245	·2246	23. 0	·0475	·2078
7. 58	21. 5	·0110	10. 20	·1232	·2223	23. 44	·0476	·2082
8. 15	52. 30	·0276	10. 28	·1280	·2309	23. 59	·0476	·2082
8. 30	30. 0	·0157	10. 32	·1268	·2287			
8. 45	20. 35	·0108	10. 40	·1319	·2379			
9. 5	31. 35	·0166	10. 55	·1258	·2269			
9. 20	25. 5	·0131	11. 10	·1315	·2372			
9. 24	26. 20	·0138	11. 20	·1272	·2295			
9. 30	26. 5	·0136	11. 23	·1275	·2300			
9. 34	28. 50	·0151	11. 33	·1256	·2266			
9. 50	26. 55	·0141	11. 39	·1258	·2269			
10. 8	31. 25	·0165	11. 48	·1222	·2205			
10. 13	30. 0	·0157	11. 58	·1210	·2183			
10. 20	32. 25	·0170	12. 13	·1243	·2242			
10. 23	30. 20	·0159	12. 17	·1240	·2237			
10. 26	38. 30	·0202	12. 25	·1266	·2284			
10. 36	27. 25	·0144	12. 33	·1265	·2282			
10. 42	41. 20	·0217	12. 40	·1270	·2291			
10. 48	38. 0	·0199	12. 50	·1254	·2262			
11. 0	20. 5	·0105	12. 57	·1257	·2268			
11. 18	29. 55	·0157	13. 10	·1241	·2239			
11. 33	22. 35	·0118	13. 18	·1244	·2244			
11. 45	29. 0	·0152	13. 32	·1230	·2219			
11. 52	28. 20	·0149	13. 50	·1248	·2251			
11. 58	29. 45	·0156	14. 0	·1242	·2241			
12. 5	27. 35	·0145	14. 24	·1276	·2302			
12. 12	28. 5	·0147	14. 30	·1268	·2287			
12. 24	22. 0	·0115	14. 55	·1310	·2363			
12. 36	19. 25	·0102	15. 14	·1294	·2334			
12. 45	20. 55	·0110	15. 18	·1297	·2340			
12. 50	19. 50	·0104	15. 22	·1288	·2323			
13. 5	22. 55	·0120	15. 28	·1292	·2331			
13. 16	21. 20	·0112	15. 40	·1256	·2266			
13. 33	29. 20	·0154	15. 45	·1262	·2277			
13. 36	29. 0	·0152	15. 55	·1250	·2255			
14. 10	40. 30	·0213	16. 8	·1247	·2250			
14. 42	24. 30	·0129	16. 18	·1250	·2255			
15. 10	34. 30	·0181	16. 25	·1244	·2244			
15. 16	34. 50	·0182	16. 32	·1251	·2257			
15. 20	33. 50	·0177	16. 40	·1257	·2268			
15. 31	36. 5	·0189	16. 50	·1271	·2293			
15. 40	33. 55	·0178	16. 54	·1268	·2287			

Greenwich Mean Solar Time.	Western Declination.	Excess of Western Declination above 18°, converted into Westerly Force, and expressed in terms of Gauss's Unit measured on the Metrical System.	Greenwich Mean Solar Time.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Horizontal Force.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System.	Greenwich Mean Solar Time.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Vertical Force.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 12			Aug. 12					
h m	° ′ ″		h m			h m		
15. 44	18. 34. 35	·0181	17. 10	·1280	·2309			
16. 0	31. 0	·0163	17. 18	·1274	·2298			
16. 20	37. 20	·0196	17. 23	·1278	·2305			
16. 35	38. 30	·0202	17. 30	·1272	·2295			
16. 50	42. 35	·0223	17. 40	·1280	·2309			
17. 5	41. 0	·0215	17. 50	·1276	·2302			
17. 18	37. 0	·0194	17. 56	·1279	·2307			
17. 30	33. 50	·0177	18. 0	·1275	·2300			
17. 37	34. 40	·0181	18. 6	·1276	·2302			
17. 44	33. 50	·0177	18. 15	·1268	·2287			
18. 4	36. 20	·0191	18. 33	·1262	·2277			
18. 20	34. 35	·0181	18. 45	·1257	·2268			
18. 25	35. 45	·0188	18. 50	·1262	·2277			
18. 32	35. 0	·0184	18. 55	·1252	·2259			
18. 36	35. 30	·0187	19. 5	·1247	·2250			
18. 48	34. 5	·0178	19. 10	·1246	·2248			
18. 58	35. 0	·0184	19. 18	·1238	·2233			
19. 7	34. 5	·0178	19. 20	·1245	·2246			
19. 10	34. 45	·0182	19. 29	·1242	·2241			
19. 18	32. 50	·0172	19. 33	·1248	·2251			
19. 20	34. 40	·0181	19. 35	·1242	·2241			
19. 25	32. 40	·0171	19. 42	·1249	·2253			
19. 30	34. 10	·0179	19. 45	·1244	·2244			
19. 33	32. 30	·0171	19. 51	·1249	·2253			
19. 36	34. 0	·0178	20. 0	·1246	·2248			
19. 44	32. 30	·0171	20. 3	·1249	·2253			
19. 48	33. 40	·0176	20. 12	·1244	·2244			
20. 12	31. 50	·0167	20. 35	·1250	·2255			
20. 20	32. 5	·0168	20. 57	·1234	·2226			
20. 30	30. 30	·0160	21. 5	·1241	·2239			
21. 5	34. 20	·0180	21. 16	·1227	·2214			
21. 32	33. 50	·0177	21. 20	·1238	·2233			
21. 47	34. 35	·0181	21. 23	·1226	·2212			
21. 57	34. 0	·0178	21. 33	·1226	·2212			
22. 40	36. 20	·0191	21. 48	·1234	·2226			
22. 58	35. 55	·0189	21. 57	·1226	·2212			
23. 15	39. 30	·0208	22. 10	·1222	·2205			
23. 22	39. 30	·0208	23. 0	·1239	·2235			
23. 59	41. 50	·0219	23. 15	·1251	·2257			
			23. 59	·1247	·2250			
Aug. 13			Aug. 13			Aug. 13		
0. 0	18. 41. 50	·0219	0. 0	·1246	·2248	0. 0	·0477	·2087
0. 6	39. 50	·0209	0. 8	·1234	·2226	0. 10	·0479	·2095
0. 12	41. 55	·0220	0. 18	·1254	·2262	0. 27	·0482	·2109
0. 18	39. 5	·0205	0. 20	·1246	·2248	0. 49	·0489	·2139
0. 20	40. 0	·0210	0. 26	·1263	·2278	1. 29	·0491	·2148
0. 33	37. 5	·0194	0. 33	·1258	·2269		(†)	
0. 39	39. 5	·0205	0. 42	·1274	·2298	2. 49	·0495	·2166
0. 55	39. 30	·0208	0. 52	·1272	·2295	3. 23	·0496	·2170
1. 7	38. 25	·0201	1. 0	·1276	·2302	3. 30	·0497	·2175
1. 15	40. 0	·0210	1. 6	·1268	·2287	4. 14	·0501	·2192

The indications are taken from the sheets of the Photographic Record. The Symbol *** denotes that the magnet has been generally in a state of slight agitation, and the Symbol (†) that the register has failed between the preceding and following readings.

For the Horizontal and Vertical Forces, increasing readings denote increasing forces.

The constant by which the values of Horizontal Force are diminished is 0·8600 nearly, as expressed in parts of the whole Horizontal Force, equivalent to 1·5514 in terms of Gauss's Unit measured on the Metrical (Millimètre-Milligramme-Second) system. The corresponding constant for Vertical Force is 0·9600 nearly, equivalent to 4·2004 in terms of Gauss's Unit. To express the Metrical measures on the C.G.S. (Centimètre-Gramme-Second) system, the numbers must be divided by 10, equivalent to shifting the decimal point one step towards the left.

Greenwich Mean Solar Time.	Western Declination.	Excess of Western Declination above 18°, converted into Westerly Force, and expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 13 h m	° ′ ″	
1. 27	18. 42. 45	·0224
1. 43	40. 0	·0210
1. 50	42. 25	·0222
2. 0	41. 0	·0215
2. 5	39. 0	·0205
2. 12	38. 5	·0199
2. 36	41. 40	·0218
2. 47	40. 30	·0213
2. 59	39. 40	·0208
3. 12	41. 25	·0217
3. 28	37. 55	·0199
3. 32	38. 30	·0202
3. 52	37. 35	·0197
4. 5	38. 50	·0203
4. 16	30. 15	·0158
4. 18	31. 40	·0166
4. 23	29. 50	·0156
4. 29	34. 45	·0182
4. 33	27. 20	·0144
4. 40	30. 30	·0160
4. 50	26. 55	·0141
5. 4	30. 45	·0161
5. 8	30. 5	·0157
5. 23	33. 5	·0173
5. 40	26. 0	·0136
5. 52	28. 0	·0147
6. 0	30. 25	·0159
6. 5	39. 30	·0208
6. 11	25. 0	·0131
6. 20	33. 30	·0176
6. 27	35. 0	·0184
6. 34	34. 30	·0181
6. 40	36. 25	·0191
6. 50	29. 50	·0156
6. 57	30. 20	·0159
7. 8	21. 0	·0110
7. 14	22. 55	·0120
7. 24	20. 35	·0108
7. 34	24. 20	·0128
7. 40	23. 25	·0123
8. 0	43. 0	·0226
8. 8	41. 40	·0218
8. 16	53. 45	·0282
8. 36	25. 0	·0131
8. 40	25. 55	·0135
8. 47	19. 0	·0100
9. 20	34. 15	·0179
9. 53	21. 10	·0111
10. 8	25. 55	·0135
10. 19	25. 0	·0131
10. 42	35. 35	·0187
11. 5	24. 0	·0125

Greenwich Mean Solar Time.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Horizontal Force.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 13 h m		
1. 8	·1272	·2295
1. 12	·1262	·2277
1. 14	·1266	·2284
1. 20	·1251	·2257
1. 23	·1252	·2259
1. 33	·1243	·2242
1. 44	·1252	·2259
1. 53	·1264	·2280
2. 7	·1252	·2259
2. 12	·1258	·2269
2. 22	·1265	·2282
2. 38	·1268	·2287
2. 53	·1258	·2269
3. 10	·1268	·2287
3. 19	·1265	·2282
3. 30	·1257	·2268
3. 40	·1267	·2286
3. 55	·1268	·2287
4. 8	·1279	·2307
4. 10	·1276	·2302
4. 27	·1321	·2383
4. 33	·1305	·2354
4. 43	·1331	·2401
4. 50	·1316	·2374
4. 59	·1334	·2406
5. 2	·1329	·2397
5. 7	·1333	·2404
5. 10	·1327	·2394
5. 22	·1307	·2358
5. 25	·1310	·2363
5. 34	·1288	·2323
5. 42	·1309	·2361
6. 4	·1291	·2329
6. 12	·1300	·2345
6. 20	·1328	·2395
6. 28	·1320	·2381
6. 33	·1305	·2354
6. 38	·1309	·2361
6. 48	·1280	·2309
6. 55	·1294	·2334
7. 4	·1285	·2318
7. 14	·1304	·2352
7. 23	·1291	·2329
7. 30	·1295	·2336
7. 40	·1283	·2314
7. 53	·1291	·2329
8. 3	·1283	·2314
8. 14	·1306	·2356
8. 30	·1228	·2215
8. 40	·1252	·2259
8. 45	·1247	·2250
8. 55	·1260	·2273

Greenwich Mean Solar Time.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Vertical Force.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 13 h m		
4. 19	·0504	·2206
4. 23	·0503	·2201
4. 32	·0502	·2197
4. 40	·0503	·2201
4. 47	·0501	·2192
4. 58	·0504	·2206
5. 28	·0502	·2197
5. 35	·0504	·2206
5. 44	·0505	·2210
6. 4	·0506	·2214
6. 12	·0504	·2206
6. 17	·0506	·2214
6. 24	·0503	·2201
6. 30	·0500	·2188
6. 45	·0499	·2183
6. 50	·0500	·2188
7. 5	·0498	·2179
7. 11	·0498	·2179
7. 20	·0496	·2170
7. 40	·0497	·2175
7. 46	·0498	·2179
7. 56	·0497	·2175
8. 6	·0493	·2157
8. 12	·0492	·2153
8. 35	·0482	·2109
8. 40	·0486	·2126
9. 3	·0490	·2144
9. 16	·0490	·2144
9. 49	·0486	·2126
10. 0	·0487	·2131
10. 20	·0481	·2104
10. 39	·0483	·2113
10. 53	·0479	·2095
11. 6	·0477	·2087
11. 46	·0461	·2017
11. 56	·0464	·2031
12. 1	·0463	·2026
12. 23	·0469	·2052
13. 5	·0462	·2022
13. 20	·0463	·2026
13. 47	·0458	·2004
14. 3	·0460	·2013
14. 18	·0456	·1995
14. 32	·0455	·1991
14. 51	·0452	·1978
15. 7	·0452	·1978
15. 39	·0455	·1991
16. 15	·0455	·1991
16. 40	·0453	·1982
16. 54	·0452	·1978
17. 35	·0452	·1978
17. 50	·0454	·1987

Greenwich Mean Solar Time.	Western Declination.	Excess of Western Declination above 18°, converted into Westerly Force, and expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 13 h m	° ′ ″	
11. 11	18. 31. 0	·0163
11. 16	28. 45	·0151
11. 40	40. 0	·0210
11. 55	24. 0	·0126
12. 20	16. 0	·0084
12. 35	25. 30	·0134
12. 42	26. 35	·0139
13. 10	20. 0	·0105
13. 28	22. 20	·0117
13. 50	18. 45	·0098
14. 6	28. 50	·0151
14. 14	28. 15	·0148
14. 30	30. 40	·0160
14. 46	30. 5	·0157
14. 50	31. 30	·0166
14. 55	29. 55	·0157
14. 58	31. 20	·0165
15. 6	28. 40	·0150
15. 14	29. 30	·0155
15. 20	26. 5	·0136
15. 24	28. 15	·0148
15. 30	26. 5	·0136
15. 33	29. 20	·0154
15. 36	29. 0	·0152
16. 0	38. 25	·0201
16. 5	38. 0	·0199
16. 18	45. 5	·0236
16. 23	44. 45	·0235
16. 36	45. 35	·0239
16. 50	42. 30	·0223
16. 56	43. 15	·0227
17. 3	42. 40	·0223
17. 10	43. 30	·0229
17. 34	39. 35	·0210
17. 40	40. 55	·0215
17. 55	34. 55	·0183
18. 23	35. 30	·0187
18. 32	34. 20	·0180
18. 40	34. 50	·0182
20. 0	29. 0	·0152
21. 2	30. 40	·0160
21. 10	30. 30	·0160
21. 23	31. 30	·0166
21. 34	31. 20	·0165
22. 56	33. 10	·0174
23. 12	33. 20	·0175
23. 59	35. 45	·0188
Nov. 2		
16. 0	18. 27. 10	·0143
16. 20	27. 55	·0147
16. 32	26. 10	·0137

Greenwich Mean Solar Time.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Horizontal Force.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 13 h m		
8. 52	·1258	·2269
9. 12	·1280	·2309
9. 50	·1238	·2233
10. 3	·1254	·2262
10. 16	·1244	·2244
10. 22	·1243	·2242
10. 49	·1225	·2210
11. 5	·1262	·2277
11. 16	·1242	·2241
11. 30	·1276	·2302
11. 54	·1208	·2179
12. 3	·1243	·2242
12. 12	·1232	·2223
12. 30	·1290	·2327
12. 50	·1272	·2295
13. 2	·1268	·2287
13. 18	·1269	·2289
13. 38	·1256	·2266
14. 0	·1268	·2287
14. 12	·1288	·2323
14. 24	·1275	·2300
14. 40	·1297	·2340
14. 52	·1278	·2305
15. 0	·1282	·2313
15. 10	·1276	·2302
15. 20	·1272	·2295
15. 40	·1269	·2289
16. 0	·1256	·2266
17. 0	·1286	·2320
17. 44	·1229	·2217
18. 13	·1251	·2257
18. 26	·1248	·2251
18. 50	·1261	·2275
19. 13	·1264	·2280
19. 55	·1256	·2266
20. 50	·1252	·2259
21. 30	·1250	·2255
22. 45	·1257	·2268
23. 35	·1258	·2269
23. 59	·1262	·2277
Nov. 2		
16. 0	·1298	·2341
16. 10	·1300	·2345
16. 26	·1305	·2354

Greenwich Mean Solar Time.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Vertical Force.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in terms of Gauss's Unit measured on the Metrical System.
Aug. 13 h m		
18. 12	·0458	·2004
19. 0	·0463	·2026
20. 0	·0466	·2039
20. 30	·0467	·2044
22. 0	·0466	·2039
23. 22	·0464	·2031
23. 59	·0466	·2039
Nov. 2		
16. 0	·0364	·1593
16. 22	·0364	·1593
16. 41	·0363	·1588

Greenwich Mean Solar Time.	Readings of Thermometers. Of H. F. Magnet.	Readings of Thermometers. Of V. F. Magnet.
Aug. 13 h m	°	°
0. 0	70·5	69·8
1. 0	71·0	70·4
2. 0	71·3	70·3
3. 0	72·0	70·8
9. 0	73·2	71·4
21. 0	69·0	68·5
22. 0	69·0	68·2
23. 0	69·0	68·5
24. 0	69·3	69·2
Nov. 2		
9. 0	61·6	61·2
21. 0	60·5	60·0
22. 0	60·4	60·1
23. 0	60·3	60·3

Greenwich Mean Solar Time.	Western Declination.	Excess of Western Declination above 18°, converted into Westerly Force, and expressed in terms of Gauss's Unit measured on the Metrical System.
Nov. 2		
h m	° ′ ″	
16. 40	18. 24. 45	·0130
17. 0	24. 0	·0126
17. 13	24. 40	·0129
17. 28	25. 30	·0134
17. 45	31. 30	·0166
17. 52	32. 10	·0169
18. 0	30. 55	·0162
18. 21	26. 30	·0139
18. 32	26. 25	·0138
18. 42	27. 0	·0142
19. 0	29. 20	·0154
19. 21	32. 35	·0171
19. 49	33. 0	·0173
20. 0	34. 25	·0180
20. 5	34. 30	·0181
20. 15	33. 30	·0176
20. 25	35. 0	·0184
20. 31	35. 30	·0187
20. 40	33. 55	·0178
20. 49	34. 45	·0182
21. 1	34. 30	·0181
21. 14	32. 0	·0168
21. 28	34. 30	·0181
21. 43	36. 5	·0189
21. 49	37. 40	·0197
21. 59	37. 0	·0194
22. 8	37. 20	·0196
22. 20	38. 5	·0199
22. 25	37. 30	·0197
22. 36	36. 10	·0190
22. 49	36. 0	·0189
22. 56	38. 0	·0199
23. 2	37. 0	·0194
23. 17	43. 0	·0226
23. 22	47. 50	·0251
23. 33	51. 45	·0272
23. 41	50. 30	·0265
23. 48	52. 45	·0277
23. 55	45. 0	·0236
Nov. 3		
0. 0	18. 48. 25	·0254
0. 5	45. 30	·0239
0. 8	46. 0	·0241
0. 18	38. 40	·0202
0. 20	39. 0	·0205
0. 28	38. 0	·0199
0. 38	40. 0	·0210
0. 50	37. 55	·0199
0. 58	38. 30	·0202
1. 2	38. 10	·0200
1. 24	40. 45	·0214

Greenwich Mean Solar Time.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Horizontal Force.	Expressed in terms of Gauss's Unit measured on the Metrical System.
Nov. 2		
h m		
16. 40	·1306	·2356
16. 59	·1300	·2345
17. 20	·1299	·2343
17. 34	·1301	·2347
17. 50	·1306	·2356
18. 3	·1313	·2368
18. 25	·1316	·2374
18. 44	·1319	·2379
19. 0	·1314	·2370
19. 10	·1313	·2368
19. 30	·1305	·2354
19. 46	·1308	·2359
20. 20	·1300	·2345
20. 25	·1302	·2349
20. 40	·1291	·2329
21. 0	·1297	·2340
21. 14	·1296	·2338
21. 25	·1299	·2343
21. 50	·1299	·2343
22. 2	·1294	·2334
22. 14	·1295	·2336
22. 23	·1290	·2327
22. 36	·1287	·2322
22. 42	·1286	·2320
22. 48	·1280	·2309
22. 55	·1280	·2309
23. 1	·1271	·2293
23. 10	·1274	·2298
23. 25	·1284	·2316
23. 38	·1284	·2316
23. 42	·1274	·2298
23. 48	·1276	·2302
Nov. 3		
0. 0	·1262	·2277
0. 12	·1274	·2298
0. 17	·1270	·2291
0. 38	·1290	·2327
0. 47	·1286	·2320
1. 0	·1289	·2325
1. 20	·1297	·2340
1. 35	·1296	·2338
1. 50	·1290	·2327
2. 0	·1300	·2345
2. 17	·1286	·2320

Greenwich Mean Solar Time.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Vertical Force.	Expressed in terms of Gauss's Unit measured on the Metrical System.
Nov. 2		
h m		
17. 21	·0361	·1579
17. 41	·0362	·1584
18. 18	·0358	·1566
18. 55	·0357	·1562
19. 23	·0356	·1557
20. 10	·0354	·1549
20. 32	·0355	·1553
20. 38	·0354	·1549
20. 52	·0354	·1549
21. 11	·0353	·1544
21. 33	·0353	·1544
22. 12	·0352	·1540
22. 55	·0353	·1544
23. 0	·0352	·1540
23. 20	·0355	·1553
23. 53	·0359	·1570
Nov. 3		
0. 0	·0362	·1584
0. 15	·0362	·1584
0. 31	·0365	·1597
1. 2	·0366	·1601
1. 45	·0366	·1601
1. 59	·0369	·1614
2. 15	·0366	·1601
2. 38	·0368	·1610
3. 20	·0370	·1619
3. 58	·0372	·1628
4. 18	·0372	·1628

Greenwich Mean Solar Time.	Western Declination.	Excess of Western Declination above 18°, converted into Westerly Force, and expressed in terms of Gauss's Unit measured on the Metrical System.
Nov. 3		
h m	° ′ ″	
1. 46	18. 38. 45	·0203
1. 58	42. 40	·0223
2. 24	37. 0	·0194
2. 33	38. 30	·0202
2. 38	37. 35	·0197
2. 58	42. 0	·0220
3. 8	42. 30	·0223
3. 40	40. 0	·0210
3. 49	41. 15	·0216
3. 53	40. 50	·0214
4. 0	42. 15	·0221
4. 5	41. 25	·0217
4. 12	42. 50	·0224
4. 18	42. 20	·0222
4. 24	43. 0	·0226
4. 36	40. 30	·0213
4. 53	31. 40	·0166
5. 4	34. 10	·0179
5. 10	31. 30	·0166
5. 28	40. 0	·0210
5. 40	32. 45	·0172
5. 42	33. 25	·0175
5. 52	20. 15	·0106
6. 5	33. 45	·0177
6. 12	28. 40	·0150
6. 18	30. 30	·0160
6. 28	17. 15	·0090
6. 38	26. 25	·0138
6. 42	24. 25	·0128
6. 48	26. 20	·0138
6. 54	16. 35	·0087
7. 3	37. 35	·0197
7. 20	25. 35	·0134
7. 30	26. 40	·0139
7. 35	25. 25	·0133
7. 40	25. 30	·0134
7. 48	23. 25	·0123
7. 55	23. 50	·0125
8. 10	18. 30	·0097
8. 20	29. 40	·0155
8. 25	27. 55	·0147
8. 30	28. 45	·0151
8. 34	26. 5	·0136
8. 40	31. 25	·0165
8. 45	28. 5	·0147
8. 56	37. 50	·0198
9. 15	21. 30	·0113
9. 34	33. 0	·0173
9. 40	32. 20	·0170
9. 48	32. 50	·0172
10. 10	23. 0	·0121
10. 28	19. 50	·0104

Greenwich Mean Solar Time.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Horizontal Force.	Expressed in terms of Gauss's Unit measured on the Metrical System.
Nov. 3		
h m		
2. 32	·1294	·2334
2. 40	·1289	·2325
3. 0	·1302	·2349
3. 15	·1284	·2316
3. 33	·1288	·2323
3. 40	·1285	·2318
3. 52	·1291	·2329
4. 0	·1298	·2341
4. 20	·1286	·2320
4. 24	·1288	·2323
4. 48	·1275	·2300
5. 0	·1283	·2314
5. 8	·1272	·2295
5. 13	·1281	·2311
5. 20	·1276	·2302
5. 23	·1279	·2307
5. 34	·1269	·2289
5. 42	·1280	·2309
5. 48	·1261	·2275
5. 58	·1281	·2311
6. 12	·1263	·2278
6. 17	·1271	·2293
6. 29	·1250	·2255
6. 38	·1284	·2316
6. 41	·1279	·2307
6. 49	·1289	·2325
6. 55	·1279	·2307
7. 0	·1316	·2374
7. 16	·1254	·2262
7. 23	·1262	·2277
7. 35	·1259	·2271
7. 55	·1264	·2280
8. 2	·1263	·2278
8. 14	·1293	·2332
8. 22	·1286	·2320
8. 27	·1300	·2345
8. 31	·1295	·2336
8. 36	·1309	·2361
8. 40	·1301	·2347
8. 48	·1316	·2374
9. 8	·1266	·2284
9. 29	·1310	·2363
9. 58	·1269	·2289
10. 7	·1268	·2287
10. 12	·1274	·2298
10. 20	·1272	·2295
10. 30	·1280	·2309
10. 40	·1285	·2318
10. 47	·1281	·2311
10. 54	·1282	·2313
11. 0	·1279	·2307
11. 12	·1303	·2350

Greenwich Mean Solar Time.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Vertical Force.	Expressed in terms of Gauss's Unit measured on the Metrical System.
Nov. 3		
h m		
4. 30	·0374	·1637
5. 5	·0380	·1663
5. 30	·0385	·1685
5. 42	·0394	·1724
5. 50	·0386	·1689
6. 3	·0383	·1676
6. 16	·0383	·1676
6. 25	·0386	·1689
6. 40	·0382	·1672
6. 54	·0379	·1658
7. 10	·0372	·1628
7. 34	·0375	·1641
8. 4	·0376	·1645
8. 18	·0372	·1628
8. 38	·0366	·1601
8. 45	·0366	·1601
9. 3	·0358	·1566
9. 11	·0360	·1575
9. 20	·0361	·1579
9. 40	·0354	·1549
10. 4	·0360	·1575
10. 28	·0362	·1584
10. 55	·0362	·1584
11. 2	·0364	·1593
11. 22	·0352	·1540
11. 33	·0356	·1557
12. 5	·0356	·1557
12. 19	·0358	·1566
12. 32	·0356	·1557
12. 51	·0356	·1557
13. 5	·0358	·1566
13. 30	·0358	·1566
13. 51	·0356	·1557
14. 19	·0355	·1553
14. 50	·0356	·1557
15. 25	·0356	·1557
16. 0	·0357	·1562
16. 33	·0356	·1557
17. 40	·0356	·1557
19. 0	·0356	·1557
20. 0	·0354	·1549
21. 0	·0352	·1540
22. 0	·0351	·1535
23. 0	·0352	·1540
23. 40	·0355	·1553
23. 59	·0356	·1557

The indications are taken from the sheets of the Photographic Record. The Symbol *** denotes that the magnet has been generally in a state of slight agitation, and the Symbol (†) that the register has failed between the preceding and following readings.

For the Horizontal and Vertical Forces, increasing readings denote increasing forces.

The constant by which the values of Horizontal Force are diminished is 0·8600 nearly, as expressed in parts of the whole Horizontal Force, equivalent to 1·5514 in terms of Gauss's Unit measured on the Metrical (Millimètre-Milligramme-Second) system. The corresponding constant for Vertical Force is 0·9600 nearly, equivalent to 4·2004 in terms of Gauss's Unit. To express the Metrical measures on the C.G.S. (Centimètre-Gramme-Second) system, the numbers must be divided by 10, equivalent to shifting the decimal point one step towards the left.

Greenwich Mean Solar Time.	Western Declination.	Excess of Western Declination above 18°, converted into Westerly Force, and expressed in terms of Gauss's Unit measured on the Metrical System.	Greenwich Mean Solar Time.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Horizontal Force.	Horizontal Force: Expressed in terms of Gauss's Unit measured on the Metrical System.	Greenwich Mean Solar Time.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Vertical Force.	Vertical Force: Expressed in terms of Gauss's Unit measured on the Metrical System.
Nov. 3			Nov. 3					
h m	° ′ ″		h m			h m		
10. 43	18. 23. 20	·0123	11. 28	·1278	·2305			
10. 48	22. 35	·0120	11. 45	·1288	·2323			
10. 55	24. 35	·0129	12. 0	·1304	·2352			
11. 0	24. 30	·0129	12. 9	·1290	·2327			
11. 12	39. 55	·0210	12. 19	·1292	·2331			
11. 32	24. 0	·0126	12. 35	·1282	·2313			
12. 2	27. 25	·0144	12. 50	·1286	·2320			
12. 12	26. 45	·0140	12. 58	·1284	·2316			
12. 24	28. 0	·0147	13. 8	·1288	·2323			
12. 53	20. 25	·0107	13. 25	·1280	·2309			
13. 20	30. 0	·0157	13. 55	·1292	·2331			
13. 25	29. 25	·0154	14. 28	·1283	·2314			
13. 32	30. 35	·0160	15. 23	·1292	·2331			
13. 50	27. 40	·0145	15. 42	·1289	·2325			
14. 6	29. 35	·0155	16. 0	·1294	·2334			
14. 12	29. 0	·0152	16. 8	·1293	·2332			
14. 16	30. 5	·0157	16. 28	·1299	·2343			
14. 20	29. 30	·0155	16. 40	·1295	·2336			
14. 24	30. 25	·0159	17. 3	·1292	·2331			
14. 28	29. 55	·0157	17. 15	·1290	·2327			
14. 53	33. 0	·0173	17. 30	·1292	·2331			
15. 16	31. 50	·0167	17. 40	·1293	·2332			
15. 25	32. 45	·0172	17. 57	·1289	·2325			
15. 32	32. 25	·0170	18. 22	·1288	·2323			
15. 40	33. 25	·0175	18. 55	·1290	·2327			
15. 46	33. 0	·0173	19. 10	·1287	·2322			
16. 2	33. 55	·0178	19. 25	·1288	·2323			
16. 15	33. 0	·0173	19. 42	·1285	·2318			
17. 0	31. 30	·0166	19. 55	·1281	·2311			
17. 18	31. 30	·0166	20. 20	·1279	·2307			
17. 28	32. 25	·0170	20. 29	·1276	·2302			

Greenwich Mean Solar Time.	Western Declination.	Excess of Western Declination above 18°, converted into Westerly Force, and expressed in terms of Gauss's Unit measured on the Metrical System.	Greenwich Mean Solar Time.	Horizontal Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Horizontal Force.	Horizontal Force: Expressed in terms of Gauss's Unit measured on the Metrical System.	Greenwich Mean Solar Time.	Vertical Force (diminished by a Constant) uncorrected for Temperature. Expressed in parts of the whole Vertical Force.	Vertical Force: Expressed in terms of Gauss's Unit measured on the Metrical System.
Nov. 3			Nov. 3					
h m	° ′ ″		h m			h m		
17. 36	18. 31. 20	·0165	20. 41	·1274	·2298			
17. 44	31. 55	·0168	20. 55	·1275	·2300			
17. 50	30. 35	·0160	21. 7	·1270	·2291			
18. 10	31. 50	·0167	21. 40	·1275	·2300			
18. 20	30. 40	·0160	21. 54	·1274	·2298			
18. 22	31. 25	·0165	22. 20	·1280	·2309			
18. 30	30. 40	·0160	22. 39	·1278	·2305			
18. 47	31. 55	·0168	23. 0	·1282	·2313			
19. 0	31. 15	·0164	23. 8	·1279	·2307			
19. 2	32. 20	·0170	23. 23	·1278	·2305			
19. 20	30. 35	·0160	23. 59	·1282	·2313			
19. 33	32. 10	·0169						
19. 38	31. 30	·0166						
19. 43	32. 30	·0171						
19. 56	31. 35	·0166						
20. 6	32. 0	·0168						
20. 27	30. 10	·0158						
20. 32	30. 45	·0161						
20. 42	30. 0	·0157						
20. 58	30. 25	·0159						
21. 5	30. 0	·0157						
21. 40	32. 0	·0168						
21. 58	31. 10	·0164						
22. 32	33. 55	·0178						
22. 38	33. 40	·0176						
23. 1	37. 10	·0195						
23. 16	35. 0	·0184						
23. 36	37. 35	·0197						
23. 47	36. 45	·0193						
23. 59	37. 55	·0199						

Greenwich Mean Solar Time.	Readings of Thermometers. Of H.F. Magnet.	Readings of Thermometers. Of V.F. Magnet.	Greenwich Mean Solar Time.	Readings of Thermometers. Of H.F. Magnet.	Readings of Thermometers. Of V.F. Magnet.	Greenwich Mean Solar Time.	Readings of Thermometers. Of H.F. Magnet.	Readings of Thermometers. Of V.F. Magnet.
Nov. 3			Nov. 3			Nov. 3		
h m	°	°	h m	°	°	h m	°	°
0. 0	60·5	60·4	3. 0	61·0	61·0	22. 0	59·8	59·5
1. 0	60·8	60·7	9. 0	61·3	61·0	23. 0	60·2	59·8
2. 0	61·0	60·9	21. 0	59·8	59·5	24. 0	60·5	60·7

ROYAL OBSERVATORY, GREENWICH.

RESULTS

OF

OBSERVATIONS

OF THE

MAGNETIC DIP.

1880.

RESULTS of OBSERVATIONS of MAGNETIC DIP, on each Day of Observation.

Day and Approximate Hour, 1880.		Needle.	Length of Needle.	Magnetic Dip.	Observer.
	d h			° ′ ″	
January	10. 2	B 1	9 inches	67. 38. 11	N
	15. 2	B 2	9 ,,	67. 33. 31	N
	16. 22	C 2	6 ,,	67. 34. 51	E
	18. 0	D 1	3 ,,	67. 36. 20	E
	18. 1	D 2	3 ,,	67. 35. 25	E
	19. 2	B 2	9 ,,	67. 35. 45	E
	20. 1	D 1	3 ,,	67. 34. 0	E
	20. 2	D 2	3 ,,	67. 34. 56	E
	21. 1	C 2	6 ,,	67. 35. 6	E
	22. 3	C 1	6 ,,	67. 35. 57	E
	23. 2	B 1	9 ,,	67. 32. 33	E
	24. 0	B 1	9 ,,	67. 36. 25	E
	26. 23	C 1	6 ,,	67. 33. 41	N
	27. 1	D 2	3 ,,	67. 35. 33	N
	27. 2	C 2	6 ,,	67. 38. 28	N
February	3. 0	C 2	6 ,,	67. 35. 16	E
	3. 1	C 1	6 ,,	67. 35. 35	E
	4. 2	B 2	9 ,,	67. 33. 23	E
	5. 1	D 1	3 ,,	67. 34. 32	E
	5. 2	D 2	3 ,,	67. 37. 41	E
	6. 2	B 1	9 ,,	67. 33. 7	E
	20. 0	C 1	6 ,,	67. 34. 33	N
	20. 1	C 2	6 ,,	67. 36. 46	N
	24. 0	D 1	3 ,,	67. 39. 21	N
	24. 2	D 2	3 ,,	67. 35. 54	N
	26. 0	B 1	9 ,,	67. 34. 14	N
	26. 2	B 2	9 ,,	67. 34. 37	N
March	2. 23	A 1	$3\frac{1}{2}$,,	67. 37. 2*	N
	3. 0	A 2	$3\frac{1}{2}$,,	67. 36. 24*	N
	3. 23	D 1	3 ,,	67. 35. 41	N
	4. 0	A 2	$3\frac{1}{2}$,,	67. 34. 24*	N
	4. 1	A 1	$3\frac{1}{2}$,,	67. 36. 58*	N
	4. 2	A 2	$3\frac{1}{2}$,,	67. 34. 41*	N
	5. 0	A 2	$3\frac{1}{2}$,,	67. 37. 17*	N
	5. 1	D 2	3 ,,	67. 34. 59	N
	5. 2	C 1	6 ,,	67. 36. 11	N
	13. 1	C 2	6 ,,	67. 36. 39	N
	16. 1	A 3	$3\frac{1}{2}$,,	67. 36. 49*	N
	16. 2	A 4	$3\frac{1}{2}$,,	67. 36. 26*	N
	16. 23	A 2	$3\frac{1}{2}$,,	67. 36. 45*	N
	17. 0	A 3	$3\frac{1}{2}$,,	67. 35. 34*	N
	17. 1	B 1	9 ,,	67. 35. 41	N
	17. 2	B 2	9 ,,	67. 36. 1	N
	17. 23	D 1	3 ,,	67. 38. 59	N
	18. 1	A 3	$3\frac{1}{2}$,,	67. 38. 58*	N
	18. 2	A 2	$3\frac{1}{2}$,,	67. 38. 45*	N
	24. 0	B 1	9 ,,	67. 34. 24	N
	24. 1	D 1	3 ,,	67. 38. 40	N
	24. 2	A 1	$3\frac{1}{2}$,,	67. 36. 26*	N
	24. 23	C 1	6 ,,	67. 37. 42	N
	25. 0	B 1	9 ,,	67. 35. 12	N
	25. 1	A 4	$3\frac{1}{2}$,,	67. 36. 25*	N
	25. 2	D 2	3 ,,	67. 36. 1	N
	25. 3	A 3	$3\frac{1}{2}$,,	67. 37. 19*	N
	30. 0	C 2	6 ,,	67. 35. 50	N

Day and Approximate Hour, 1880.		Needle.	Length of Needle.	Magnetic Dip.	Observer.
	d h			° ′ ″	
March	30. 1	A 4	$3\frac{1}{2}$ inches	67. 35. 23*	N
	30. 2	B 2	9 ,,	67. 33. 36	N
	30. 23	D 2	3 ,,	67. 35. 49	N
April	7. 0	C 1	6 ,,	67. 36. 1	N
	7. 2	C 2	6 ,,	67. 35. 4	N
	15. 23	D 1	3 ,,	67. 36. 40	N
	16. 0	C 2	6 ,,	67. 36. 28	N
	16. 2	D 2	3 ,,	67. 36. 24	N
	27. 1	B 1	9 ,,	67. 34. 39	N
	27. 2	B 2	9 ,,	67. 35. 37	N
	27. 23	C 2	6 ,,	67. 37. 19	N
	28. 0	D 1	3 ,,	67. 34. 47	N
	28. 2	C 1	6 ,,	67. 33. 49	N
	28. 23	C 1	6 ,,	67. 36. 39	N
	29. 23	D 1	3 ,,	67. 35. 40	N
	30. 0	B 1	9 ,,	67. 36. 44	N
	30. 2	D 2	3 ,,	67. 35. 18	N
May	7. 1	C 1	6 ,,	67. 36. 38	N
	7. 2	D 1	3 ,,	67. 35. 34	N
	13. 1	B 1	9 ,,	67. 35. 44	N
	13. 2	C 2	6 ,,	67. 34. 31	N
	18. 2	D 2	3 ,,	67. 36. 6	N
	25. 1	C 1	6 ,,	67. 34. 31	N
	25. 23	B 2	9 ,,	67. 35. 19	N
	26. 2	B 1	9 ,,	67. 33. 34	N
	26. 23	C 2	6 ,,	67. 38. 0	N
	27. 2	B 2	9 ,,	67. 33. 35	N
	27. 23	C 1	6 ,,	67. 35. 55	N
	31. 3	D 1	3 ,,	67. 34. 46	N
June	4. 3	D 2	3 ,,	67. 36. 26	N
	12. 1	C 1	6 ,,	67. 34. 17	N
	17. 2	C 2	6 ,,	67. 35. 55	N
	17. 3	D 1	3 ,,	67. 34. 3	N
	18. 1	B 2	9 ,,	67. 37. 16	N
	18. 2	C 1	6 ,,	67. 35. 20	N
	23. 1	B 1	9 ,,	67. 33. 47	N
	23. 2	B 2	9 ,,	67. 35. 2	N
	25. 2	D 1	3 ,,	67. 34. 45	N
	29. 0	B 1	9 ,,	67. 34. 42	N
	29. 1	C 2	6 ,,	67. 36. 29	N
	30. 0	C 1	6 ,,	67. 35. 18	N
	30. 1	D 1	3 ,,	67. 35. 56	N
	30. 3	D 2	3 ,,	67. 35. 27	N
July	5. 2	C 2	6 ,,	67. 34. 42	N
	8. 0	B 2	9 ,,	67. 33. 1	N
	13. 0	D 2	3 ,,	67. 33. 43	N
	13. 2	B 1	9 ,,	67. 32. 55	N
	16. 1	D 2	3 ,,	67. 35. 27	N
	20. 0	B 2	9 ,,	67. 35. 22	N
	20. 2	C 2	6 ,,	67. 35. 41	N
	27. 2	C 1	6 ,,	67. 35. 14	N
	30. 1	B 1	9 ,,	67. 34. 37	N

* These results were obtained from Dover's Dip Circle, No. 51, supplied with four $3\frac{1}{2}$-inch needles, marked respectively A 1, A 2, A 3, and A 4. The initials E and N are those of Mr. Ellis and Mr. Nash respectively.

RESULTS of OBSERVATIONS of MAGNETIC DIP, on each Day of Observation—*concluded.*

Day and Approximate Hour, 1880.	Needle.	Length of Needle.	Magnetic Dip.	Observer.
d h			° ′ ″	
July 30. 2	D 1	3 inches	67. 36. 32	N
31. 0	D 2	3 ,,	67. 37. 14	N
August 4. 2	D 2	3 ,,	67. 34. 25	N
10. 1	B 2	9 ,,	67. 35. 26	N
10. 2	C 2	6 ,,	67. 36. 3	N
17. 2	C 1	6 ,,	67. 38. 26	E
18. 2	C 2	6 ,,	67. 34. 28	E
24. 1	B 2	9 ,,	67. 35. 59	N
26. 1	B 1	9 ,,	67. 35. 23	N
26. 2	D 1	3 ,,	67. 36. 54	N
27. 0	D 2	3 ,,	67. 37. 19	N
31. 1	C 2	6 ,,	67. 36. 40	N
31. 2	C 1	6 ,,	67. 37. 21	N
September 2. 2	B 2	9 ,,	67. 36. 21	N
3. 2	C 2	6 ,,	67. 35. 57	N
10. 2	D 1	3 ,,	67. 37. 3	N
16. 2	C 1	6 ,,	67. 35. 2	N
22. 1	B 1	9 ,,	67. 36. 46	N
22. 2	B 2	9 ,,	67. 35. 57	N
24. 2	D 2	3 ,,	67. 37. 11	N
27. 2	D 1	3 ,,	67. 35. 39	N
29. 23	B 2	9 ,,	67. 35. 58	N
30. 0	D 2	3 ,,	67. 36. 30	N
30. 2	B 1	9 ,,	67. 35. 57	N
October 6. 2	C 2	6 ,,	67. 35. 42	N
13. 2	B 2	9 ,,	67. 35. 29	N
14. 2	D 1	3 ,,	67. 35. 17	N
14. 3	D 2	3 ,,	67. 36. 19	N
October 21. 0	B 1	9 inches	67. 33. 29	N
21. 2	B 2	9 ,,	67. 33. 40	N
27. 2	C 1	6 ,,	67. 37. 50	N
29. 0	B 1	9 ,,	67. 34. 56	N
29. 2	D 1	3 ,,	67. 37. 10	N
30. 0	C 2	6 ,,	67. 36. 51	N
30. 2	C 1	6 ,,	67. 36. 0	N
November 4. 2	D 2	3 ,,	67. 38. 30	N
9. 2	C 1	6 ,,	67. 35. 2	N
9. 3	D 1	3 ,,	67. 35. 19	N
17. 2	B 1	9 ,,	67. 33. 0	N
18. 2	C 2	6 ,,	67. 34. 49	N
24. 22	B 1	9 ,,	67. 34. 6	N
24. 23	B 2	9 ,,	67. 34. 50	N
25. 0	D 1	3 ,,	67. 36. 33	N
25. 2	D 2	3 ,,	67. 34. 15	N
29. 2	B 2	9 ,,	67. 35. 13	N
30. 0	B 1	9 ,,	67. 34. 38	N
30. 1	D 2	3 ,,	67. 37. 5	N
December 6. 2	B 2	9 ,,	67. 34. 32	N
8. 1	C 1	6 ,,	67. 34. 56	N
8. 2	C 2	6 ,,	67. 36. 20	N
8. 22	C 1	6 ,,	67. 36. 29	N
9. 0	B 1	9 ,,	67. 34. 11	N
9. 2	D 1	3 ,,	67. 35. 26	N
17. 1	D 1	3 ,,	67. 36. 18	N
17. 2	D 2	3 ,,	67. 36. 35	N
21. 2	B 2	9 ,,	67. 35. 57	N

The initials E and N are those of Mr. Ellis and Mr. Nash respectively.

MONTHLY MEANS of MAGNETIC DIPS.

Month, 1880.	B 1, 9-inch Needle.	Number of Observations.	B 2, 9-inch Needle.	Number of Observations.	C 1, 6-inch Needle.	Number of Observations.
	° ′ ″		° ′ ″		° ′ ″	
January	67. 35. 43	3	67. 34. 38	2	67. 34. 49	2
February	67. 33. 40	2	67. 34. 0	2	67. 35. 4	2
March	67. 35. 6	3	67. 34. 58	2	67. 36. 56	2
April	67. 35. 42	2	67. 35. 37	1	67. 35. 30	3
May	67. 34. 39	2	67. 34. 27	2	67. 35. 41	3
June	67. 34. 15	2	67. 36. 9	2	67. 34. 58	3
July	67. 33. 46	2	67. 34. 12	2	67. 35. 14	1
August	67. 35. 23	1	67. 35. 42	2	67. 37. 53	2
September	67. 36. 22	2	67. 36. 5	3	67. 35. 2	1
October	67. 34. 12	2	67. 34. 35	2	67. 36. 55	2
November	67. 33. 55	3	67. 35. 2	2	67. 35. 2	1
December	67. 34. 11	1	67. 35. 15	2	67. 35. 42	2
Means	67. 34. 45	Sum 25	67. 35. 4	Sum 24	67. 35. 46	Sum 24

Month, 1880.	C 2, 6-inch Needle.	Number of Observations.	D 1, 3-inch Needle.	Number of Observations.	D 2, 3-inch Needle.	Number of Observations.
	° ′ ″		° ′ ″		° ′ ″	
January	67. 36. 8	3	67. 35. 10	2	67. 35. 18	3
February	67. 36. 1	2	67. 36. 56	2	67. 35. 47	2
March	67. 36. 14	2	67. 37. 47	3	67. 35. 36	3
April	67. 36. 17	3	67. 35. 42	3	67. 35. 51	2
May	67. 36. 16	2	67. 35. 10	2	67. 36. 6	1
June	67. 36. 12	2	67. 34. 55	3	67. 35. 56	2
July	67. 35. 12	2	67. 36. 32	1	67. 35. 28	3
August	67. 35. 44	3	67. 36. 54	1	67. 35. 52	2
September	67. 35. 57	1	67. 36. 21	2	67. 36. 50	2
October	67. 36. 16	2	67. 36. 13	2	67. 36. 19	1
November	67. 34. 49	1	67. 35. 56	2	67. 36. 37	3
December	67. 36. 20	1	67. 35. 52	2	67. 36. 35	1
Means	67. 36. 0	Sum 24	67. 36. 5	Sum 25	67. 36. 1	Sum 25

For this table the monthly means have been formed without reference to the hour at which the observation was made on each day.

In combining the monthly results, to form the annual means, weights have been given proportional to the number of observations.

The mean values of dip found from the observations made during the month of March with the four 5½-inch needles of Dover's Dip Circle, No. 51, are, for A 1 = 67°. 36′. 49″; A 2 = 67°. 36′. 23″; A 3 = 67°. 37′. 10″; A 4 = 67°. 36′. 5″.

YEARLY MEANS of MAGNETIC DIPS for each of the NEEDLES, and GENERAL MEAN for the Year 1880.

Lengths of the several Sets of Needles.	Needles.	Number of Observations with each Needle.	Mean Yearly Dips from Observations with each Needle.	Mean Yearly Dips from each Set of Needles.	Mean Yearly Dip from all the Sets of Needles.
			° ′ ″	° ′ ″	° ′ ″
9-inch Needles	B 1	25	67. 34. 45	67. 34. 55	
	B 2	24	67. 35. 4		
6-inch Needles	C 1	24	67. 35. 46	67. 35. 53	67. 35. 37
	C 2	24	67. 36. 0		
3-inch Needles	D 1	25	67. 36. 5	67. 36. 3	
	D 2	25	67. 36. 1		

ROYAL OBSERVATORY, GREENWICH.

OBSERVATIONS

OF

DEFLEXION OF A MAGNET

FOR

ABSOLUTE MEASURE

OF

HORIZONTAL FORCE.

1880

ABSTRACT of the OBSERVATIONS of DEFLEXION of a MAGNET for ABSOLUTE MEASURE of HORIZONTAL FORCE.

Month and Day, 1880.	Distances of Centers of Magnets.	Temperature.	Observed Deflexion.	Mean of the Times of Vibration of Deflecting Magnet.	Number of Vibrations.	Temperature.	Observer.
	ft.	°	° ′ ″	s		°	
January 28	1 ·0 1 ·3	30 ·2	10. 51. 29 4. 55. 30	5 ·610 5 ·608	100 100	30 ·6 29 ·8	N
February 25	1 ·0 1 ·3	47 ·7	10. 49. 19 4. 54. 36	5 ·622 5 ·621	100 100	48 ·6 50 ·6	N
March 31	1 ·0 1 ·3	55 ·3	10. 48. 45 4. 54. 5	5 ·621 5 ·625	100 100	56 ·8 56 ·7	N
April 29	1 ·0 1 ·3	59 ·6	10. 48. 26 4. 54. 6	5 ·627 5 ·620	100 100	61 ·7 57 ·8	N
May 28	1 ·0 1 ·3	64 ·1	10. 46. 32 4. 53. 29	5 ·627 5 ·629	100 100	67 ·1 66 ·0	N
June 24	1 ·0 1 ·3	71 ·2	10. 45. 53 4. 53. 6	5 ·636 5 ·630	100 100	73 ·1 73 ·0	N
July 28	1 ·0 1 ·3	68 ·1	10. 46. 17 4. 53. 19	5 ·635 5 ·636	100 100	68 ·1 69 ·4	N
August 30	1 ·0 1 ·3	72 ·2	10. 45. 30 4. 52. 56	5 ·638 5 ·638	100 100	72 ·3 72 ·7	N
September 28	1 ·0 1 ·3	64 ·0	10. 46. 59 4. 53. 36	5 ·640 5 ·642	100 100	64 ·3 64 ·9	N
October 28	1 ·0 1 ·3	51 ·2	10. 49. 4 4. 54. 17	5 ·640 5 ·638	100 100	50 ·9 51 ·1	N
November 27	1 ·0 1 ·3	54 ·4	10. 46. 19 4. 53. 11	5 ·635 5 ·634	100 100	55 ·6 54 ·9	N
December 21	1 ·0 1 ·3	38 ·3	10. 48. 45 4. 54. 31	5 ·628 5 ·626	100 100	37 ·9 39 ·4	N

The position of the Deflecting Magnet with regard to the suspended Magnet is always that which was formerly termed "Lateral." The Deflecting Magnet is placed on the East side of the suspended Magnet, with its marked pole alternately E. and W., and it is placed on the West side with its pole alternately E. and W.; and the deflexion in the table above is the mean of the four deflexions observed in those positions of the magnets.

The lengths of 1 foot and 1·3 foot correspond to 304·8 and 396·2 millimètres respectively.

The initial N is that of Mr. Nash.

In the following calculations every observation is reduced to the temperature 35°.

COMPUTATION of the VALUES of ABSOLUTE MEASURE of HORIZONTAL FORCE in the Year 1880.

Month and Day, 1880.		In English Measure.									In Metric Measure.
		Apparent Value of A_1.	Apparent Value of A_2.	Apparent Value of P.	Mean Value of P.	Log. $\frac{m}{X}$	Adopted Time of Vibration of Deflecting Magnet.	Log. m X.	Value of m.	Value of X.	Value of X.
							s				
January	28	0·09411	0·09422	−0·00293		8·97507	5·6090	0·16064	0·3697	3·915	1·805
February	25	0·09407	0·09420	−0·00350		8·97493	5·6215	0·15998	0·3694	3·913	1·804
March	31	0·09411	0·09416	−0·00130		8·97492	5·6230	0·16021	0·3695	3·914	1·805
April	29	0·09413	0·09423	−0·00265		8·97514	5·6235	0·16034	0·3696	3·914	1·805
May	28	0·09393	0·09411	−0·00468		8·97440	5·6280	0·16015	0·3692	3·916	1·806
June	24	0·09396	0·09411	−0·00395		8·97445	5·6330	0·15982	0·3691	3·915	1·805
July	28	0·09396	0·09412	−0·00423	−0·00341	8·97450	5·6355	0·15913	0·3688	3·911	1·803
August	30	0·09392	0·09407	−0·00395		8·97427	5·6380	0·15898	0·3687	3·912	1·804
September	28	0·09399	0·09415	−0·00395		8·97463	5·6410	0·15798	0·3684	3·906	1·801
October	28	0·09408	0·09415	−0·00180		8·97486	5·6390	0·15734	0·3682	3·902	1·799
November	27	0·09374	0·09385	−0·00299		8·97337	5·6345	0·15831	0·3680	3·913	1·804
December	21	0·09384	0·09403	−0·00502		8·97400	5·6270	0·15838	0·3683	3·910	1·803
Means........		..	..	..	..	..	..	..	..	3·912	1·804

The value of X in column 10 is referred to the unit Foot-Grain-Second, and that in column 11 to the unit Millimètre-Milligramme-Second. To obtain X in the Centimètre-Gramme-Second (C.G.S.) unit, the value given in column 11 must be divided by 10, equivalent to shifting the decimal point one step towards the left.

ROYAL OBSERVATORY, GREENWICH.

RESULTS

OF

METEOROLOGICAL OBSERVATIONS.

1880.

MONTH and DAY. 1880.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Of the Air. Lowest.	Of the Air. Daily Range.	Of the Air. Mean of 24 Hourly Values.	Of the Air. Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	hours	hours	in.		
Jan. 1	..	29·770	54·1	50·0	4·1	51·5	+ 13·4	49·5	47·5	4·0	6·8	2·4	86	64·0	49·1	0·1	7·9	0·005	2·5	wP : mP
2	..	29·977	50·5	40·4	10·1	46·8	+ 8·9	43·9	40·6	6·2	9·7	4·0	79	70·1	38·0	0·4	7·9	0·001	5·2	wP : mP
3	In Equator	30·258	47·3	38·1	9·2	41·8	+ 4·0	39·8	37·3	4·5	8·6	1·8	84	76·6	34·6	5·0	7·9	0·000	0·0	mP : wP
4	..	30·306	43·9	33·0	10·9	39·1	+ 1·4	37·8	36·1	3·0	8·6	0·5	89	71·3	29·1	3·9	7·9	0·000	0·0	wP : mP
5	Last Qr.	30·319	41·9	32·0	9·9	37·4	− 0·2	36·3	34·8	2·6	4·1	0·7	90	49·6	28·0	0·0	7·9	0·000	1·2	mP : sP
6	..	30·413	36·1	32·5	3·6	34·1	− 3·5	33·0	31·1	3·0	4·4	2·3	89	41·0	31·7	0·0	8·0	0·000	3·8	sP
7	..	30·477	37·0	33·2	3·8	34·4	− 3·2	33·9	33·1	1·3	2·3	0·6	94	42·8	33·1	0·0	8·0	0·006	1·0	sP
8	..	30·400	33·2	29·4	3·8	31·8	− 5·9	31·3	30·2	1·6	2·8	0·0	94	36·3	29·4	0·0	8·0	0·009	3·0	sP
9	Greatest Declination S	30·373	31·7	29·3	2·4	30·7	− 7·0	30·3	29·2	1·5	2·5	0·0	94	34·4	29·0	0·0	8·1	0·011	0·0	sP
10	Perigee	30·383	39·8	31·2	8·6	35·5	− 2·3	34·7	33·5	2·0	3·4	0·7	92	49·3	30·5	0·0	8·1	0·019	1·5	sP : vP, mN : mP
11	New	30·388	37·7	29·5	8·2	34·8	− 3·1	33·3	30·8	4·0	5·7	2·0	85	40·6	25·5	0·0	8·1	0·000	4·5	mP : sP
12	..	30·413	37·1	28·4	8·7	32·2	− 5·9	31·0	28·4	3·8	9·8	0·4	86	68·5	23·5	2·8	8·2	0·000	0·0	sP
13	..	30·307	34·3	27·0	7·3	30·6	− 7·6	30·4	29·8	0·8	4·4	0·0	97	49·0	22·6	0·0	8·2	0·015	0·0	sP : sP, wN : sP
14	..	30·158	34·5	29·1	5·4	31·6	− 6·7	30·4	27·5	4·1	6·8	1·0	84	34·5	29·1	0·0	8·2	0·000	0·0	vP : vP, wN : sP
15	..	30·102	35·1	30·8	4·3	33·4	− 5·0	31·3	27·4	6·0	8·9	1·4	78	40·0	27·0	0·0	8·3	0·055	0·0	sP : sP, sN
16	In Equator	29·858	38·8	33·3	5·5	36·5	− 2·0	35·7	34·6	1·9	4·9	0·2	93	44·0	31·0	0·0	8·3	0·135	0·0	vP : sN : vP, mN
17	..	29·855	37·4	28·8	8·6	34·1	− 4·5	32·8	30·6	3·5	6·2	1·1	87	80·7	24·3	2·3	8·3	0·000	2·0	vP
18	..	29·846	35·3	23·3	12·0	30·2	− 8·6	29·4	27·0	3·2	9·0	0·0	88	48·0	20·2	0·0	8·4	0·000	1·0	sP
19	First Qr.	30·241	33·1	21·4	11·7	27·5	−11·4	25·7	18·0	9·5	16·3	1·3	65	77·9	18·2	5·4	8·4	0·000	3·0	sP
20	..	30·450	27·3	17·6	9·7	23·8	−15·3	22·9	17·6	6·2	9·3	0·0	75	41·0	16·0	0·0	8·5	0·000	0·0	— : mN, sP
21	Apogee	30·429	32·3	19·3	13·0	27·4	−11·9	26·5	22·6	4·8	8·1	1·7	81	32·5	17·5	0·0	8·5	0·000	0·0	sP
22	..	30·215	37·8	26·6	11·2	32·6	− 6·9	31·3	28·6	4·0	7·5	1·8	85	53·9	24·0	1·3	8·6	0·005	0·0	sP
23	Greatest Declination N	30·277	37·7	32·5	5·2	35·1	− 4·5	33·5	31·0	4·1	8·3	1·8	85	48·3	28·2	0·0	8·6	0·000	0·0	sP
24	..	30·246	34·7	30·0	4·7	33·3	− 6·4	30·9	26·3	7·0	9·3	3·8	75	38·3	29·0	0·0	8·7	0·000	1·0	sP
25	..	30·035	34·4	22·8	11·6	29·7	−10·1	28·0	22·5	7·2	11·2	2·2	73	61·0	18·5	1·2	8·7	0·000	6·0	sP
26	..	30·130	33·9	17·8	16·1	26·0	−13·9	25·3	21·7	4·3	8·6	0·0	82	73·1	13·5	4·0	8·8	0·000	0·0	sP
27	Full	30·180	36·3	17·2	19·1	25·4	−14·6	24·9	22·3	3·1	9·9	0·0	87	64·4	14·0	2·5	8·8	0·000	0·0	sP
28	..	30·129	27·1	20·2	6·9	23·4	−16·7	23·3	22·7	0·7	3·6	0·0	97	46·8	18·8	0·9	8·9	0·000	0·0	sP
29	..	30·034	30·3	17·7	12·6	23·3	−16·9	23·3	23·3	0·0	1·0	0·0	100	42·3	17·7	0·0	8·9	0·000	0·0	sP
30	In Equator	30·044	50·7	20·6	30·1	38·8	− 1·5	36·8	34·1	4·7	9·0	0·0	83	92·0	18·5	7·6	9·0	0·000	0·0	sP
31	..	30·175	48·6	28·1	20·5	38·5	− 1·9	37·1	35·2	3·3	8·8	0·0	88	61·5	26·0	4·9	9·0	0·000	0·0	sP
Means	..	30·200	37·7	28·1	9·6	33·3	− 5·5	32·1	29·5	3·7	7·1	1·0	86·0	54·0	25·7	1·4	8·4	Sum 0·261	1·2	..
Number of Column for Reference	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The results apply to the civil day.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers.

The values given in Columns 3, 4, 5, 14, and 15, are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was $30^{\text{in}}\cdot 200$, being $0^{\text{in}}\cdot 471$ *higher* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 54°·1 on January 1; the lowest in the month was 17°·2 on January 27; and the range was 36°·9.
The mean of all the highest daily readings in the month was 37°·7, being 5°·7 *lower* than the average for the 39 years, 1841–1879.
The mean of all the lowest daily readings in the month was 28°·1, being 5°·6 *lower* than the average for the 39 years, 1841–1879.
The mean daily range was 9°·6, being *the same as* the average for the 39 years, 1841–1879.
The mean for the month was 33°·3, being 5°·5 *lower* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1880.	WIND AS DEDUCED FROM SELF-REGISTERING ANEMOMETERS.						CLOUDS AND WEATHER.	
	OSLER'S.					ROBINSON'S.		
	General Direction.		Pressure on the Square Foot.			Horizontal Movement of the Air.		
	A.M.	P.M.	Greatest.	Least.	Mean of 24 Hourly Measures.		A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
Jan. 1	WSW	WSW : SW	5·3	0·1	1·6	626	10, slt.-r, w : 10, w	10, slt.-r, w : 10
2	SW : WSW	WSW : SW	4·0	0·0	1·0	543	10 : 10, slt.-r	7,cu.-s,ci.-cu,ci.-s,ci : 0
3	WSW	WSW	2·0	0·0	0·1	335	0, ho.-fr : 1, ci	1,ci.-s,th.-cl : 0 : 0, hy.-d
4	WSW : SSW	SW : SSW : S	0·0	0·0	0·0	219	0 : 3, li.-cl	4,ci.-cu,cu.-s: 0 : v
5	SSW : Calm : S	SSW : S	0·0	0·0	0·0	128	10 : 7, ci.-cu, f	9, ci.-cu, cu.-s : 10
6	S : SSW	S : SSE	0·0	0·0	0·0	70	10 : 10	10 : 10
7	S : Calm	ENE : ESE	0·0	0·0	0·0	87	10 : 10	10 : 10, m.-r
8	ESE : SE	SSE : S	0·0	0·0	0·0	89	10 : 10, m.-r	10, oc.-m.-r : 10, oc.-m.-r
9	SSW : SE	Calm : ENE	0·0	0·0	0·0	56	10 : 10, m.-r	10, m.-r : 10
10	NE	ENE : E	1·5	0·0	0·0	194	10 : 10, th.-r	10, oc.-th.-r : 10, oc.-th.-r
11	E : ENE	ENE : E	2·5	0·0	0·1	299	10 : 10	10 : v : 2, ci.-cu
12	E	ENE : E : ESE	0·0	0·0	0·0	171	ho.-fr : p.-cl	6, cu.-s : 10 : 10
13	ESE : E	ENE : NE : NNE	0·0	0·0	0·0	105	10, ho.-fr : 10, slt.-f, ho.-fr	10, slt.-f : 10,slt.-sn,oc.-r: 10, sn, th.-r
14	N : NNW	NNW	0·0	0·0	0·0	193	10, th.-r : 10, glm	10, glm : 10
15	NNW	WSW	0·3	0·0	0·0	253	10 : 10	v, h, ci.-cu : v, sn : 10, sn
16	WSW : NE : SW	WSW : W : NW	0·0	0·0	0·0	186	10 : 10, slt.-r	10, th.-r : 10, th.-r
17	NNE	NNE : NNW : WSW	0·0	0·0	0·0	161	10 : 10	5,ci.-cu,cu.-s: v : 10, slt.-f
18	SW	SW : NE : SE	0·0	0·0	0·0	115	ho.-fr : 0, slt.-f, ho.-fr	0, h, f, glm : p.-cl : 10
19	ENE : E	E	2·6	0·0	0·3	305	p.-cl : 8, cu.-s	2,cu,ci.-cu,cu.-s: 0 : 0, ho.-fr
20	N : SW	SW : NW : WSW	0·0	0·0	0·0	95	ho.-fr : 8, cu.-s, ci.-cu, f	5,cu.-s,ci.-cu,f: 0, f : v, f
21	WSW	SW	0·0	0·0	0·0	145	p.-cl : 10, slt.-f	10, slt.-f : 10, slt.-f
22	WSW	N	1·2	0·0	0·1	240	10 : f, ho.-fr	v,cu.-s,ci.-cu,sn: sl, lu.-co : th.-cl
23	N : NNE	NNE	0·0	0·0	0·0	160	10 : 10	10 : 10
24	Calm	SSE : SE	0·0	0·0	0·0	72	10 : 10	10 : 10
25	SE : ESE	ESE : E	0·2	0·0	0·0	145	10 : 10, cu.-s, ci.-cu	v, ci.-cu, cu.-s : v
26	ENE : ESE	E	0·0	0·0	0·0	100	0, ho.-fr : 0, f, ho.-fr	0 : 0, ho.-fr
27	E : Calm	ESE : Calm	0·0	0·0	0·0	74	0, ho.-fr : 0, tk.-f	0 : 0, f, ho.-fr
28	S : SE	SSE : E	0·0	0·0	0·0	42	0, ho.-fr, tk.-f : 0, tk.-f, ho.-fr	0, f : 0, f : ho.-fr, tk.-f
29	SSE : SSW	WSW : Calm	0·0	0·0	0·0	33	tk.-f, ho.-fr : tk.-f, ho.-fr	0, f : 0, f : 0, tk.-f
30	SSE : S	SSW : SSE	0·2	0·0	0·0	222	0 : 0	0 : 0 : 0, f, ho.-fr
31	SSE	Variable	0·0	0·0	0·0	87	0, ho.-fr : 0, ho.-fr, f	0, f : 0, tk.-f
Means	...	...	..	..	0·1	179		
Number of Column for Reference.	21	22	23	24	25	26	27	28

The mean *Temperature of Evaporation* for the month was 32°·1, being 5°·3 *lower* than
The mean *Temperature of the Dew Point* for the month was 29°·5, being 5°·9 *lower* than
The mean *Degree of Humidity* for the month was 86·0, being 1·3 *less* than
The mean *Elastic Force of Vapour* for the month was 0in·163, being 0in·044 *less* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 2grs·0, being 0gr·4 *less* than
The mean *Weight of a Cubic Foot of Air* for the month was 568 grains, being 16 grains *greater* than
} the average for the 20 years, 1849-1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 6·3.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·17. The maximum daily amount of *Sunshine* was 7·6 hours on January 30.

The highest reading of the *Solar Radiation Thermometer* was 92°·0 on January 30; and the lowest reading of the *Terrestrial Radiation Thermometer* was 13°·5 on January 26.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 1·0; for the 6 hours ending 3 p.m., 0·1; and for the 6 hours ending 9 p.m., 0·1.

The *Proportions of Wind* referred to the cardinal points were N. 4, E. 8, S. 8, and W. 7. Four days were calm.

The *Greatest Pressure of the Wind* in the month was 5lbs·3 on the square foot on January 1. The mean daily *Horizontal Movement of the Air* for the month was 179 miles; the greatest daily value was 626 miles on January 1; and the least daily value 33 miles on January 29.

Rain fell on 9 days in the month, amounting to 0in·261, as measured in the simple cylinder gauge partly sunk below the ground; being 1in·857 *less* than the average fall for the 39 years, 1841-1879.

Month and Day, 1880.	Phases of the Moon.	Barometer. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	Temperature. Of the Air. Highest.	Temperature. Of the Air. Lowest.	Temperature. Of the Air. Daily Range.	Temperature. Of the Air. Mean of 24 Hourly Values.	Temperature. Of the Air. Excess of Mean above Average of 20 Years.	Temperature. Of Evaporation. Mean of 24 Hourly Values.	Temperature. Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Difference. Greatest of 24 Hourly Values.	Difference. Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	Temperature. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Temperature. Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	hours.	hours.	in.		
Feb. 1	..	30·162	45·7	27·0	18·7	34·6	− 5·9	33·6	32·0	2·6	7·8	0·0	90	59·0	20·3	1·7	9·1	0·014	0·0	—
2	..	30·173	47·2	23·0	24·2	35·2	− 5·4	34·7	34·0	1·2	5·9	0·0	96	76·5	18·0	2·3	9·2	0·007	0·0	— : sP
3	Last Qr.	30·265	45·5	38·0	7·5	40·7	0·0	40·4	40·1	0·6	3·7	0·0	98	53·3	30·0	0·0	9·2	0·000	0·0	sP : sP
4	..	30·194	42·1	30·0	12·1	36·5	− 4·2	35·8	34·9	1·6	7·5	0·0	94	63·8	20·9	2·4	9·3	0·000	0·0	ssP
5	..	29·939	45·6	26·0	19·6	35·2	− 5·4	34·5	33·4	1·8	7·5	0·0	93	81·0	20·1	4·4	9·3	0·002	3·7	ssP : sP
6	Greatest Dec. S. Perigee.	29·726	47·4	40·4	7·0	44·0	+ 3·6	43·5	42·9	1·1	2·7	0·0	96	63·3	36·9	0·1	9·4	0·016	4·0	mP : mP
7	..	29·462	48·6	45·8	2·8	47·0	+ 6·8	46·2	45·3	1·7	3·1	0·0	94	51·3	43·8	0·0	9·4	0·223	12·5	wP, wN : wP, wN
8	..	29·351	47·7	34·7	13·0	43·0	+ 3·1	41·8	40·4	2·6	6·7	0·0	90	66·6	30·0	0·8	9·5	0·312	4·8	wN, wP : mP
9	..	29·201	48·0	36·0	12·0	42·3	+ 2·7	40·8	39·0	3·3	6·9	0·0	89	84·5	31·0	2·2	9·6	0·218	12·7	mP, wN : wP, wN
10	New	29·284	46·8	33·1	13·7	40·6	+ 1·3	38·9	36·8	3·8	7·6	1·0	87	60·0	28·1	1·0	9·6	0·000	5·3	wP : mP
11	..	29·364	43·0	33·4	9·6	38·7	− 0·4	37·3	35·4	3·3	7·4	0·7	89	61·0	27·0	0·1	9·7	0·000	0·0	mP : vP
12	In Equator	29·691	51·6	31·7	19·9	40·8	+ 1·9	38·8	36·3	4·5	15·1	0·5	85	81·3	25·1	2·6	9·8	0·031	0·0	mP : mP
13	..	29·997	47·7	34·2	13·5	39·7	+ 0·9	37·4	34·4	5·3	12·4	0·5	82	92·0	27·0	7·3	9·8	0·000	0·7	sP : sP
14	..	29·729	44·6	36·5	8·1	41·3	+ 2·6	39·8	37·9	3·4	6·2	0·5	89	59·0	30·3	0·0	9·9	0·051	3·8	mP : vN, wP
15	..	29·532	46·9	40·9	6·0	43·5	+ 4·8	42·4	41·1	2·4	6·3	0·0	91	87·3	34·0	0·8	9·9	0·123	11·5	mP : mP, vN
16	..	28·975	54·0	44·6	9·4	47·4	+ 8·6	45·3	43·0	4·4	9·8	1·3	86	73·7	40·1	0·2	10·0	0·331	16·3	wP, vN : wP
17	..	28·938	51·8	39·9	11·9	45·7	+ 6·8	43·6	41·2	4·5	9·2	0·0	85	91·2	34·9	2·6	10·1	0·113	5·7	wP : mP
18	First Quarter Apogee	29·196	53·7	41·2	12·5	47·8	+ 8·8	45·9	43·8	4·0	8·4	1·0	87	89·8	36·0	2·0	10·1	0·165	11·0	wP, wN : wP, wN
19	Greatest Declination N	29·152	51·8	48·9	2·9	49·7	+10·5	47·9	46·0	3·7	7·1	1·5	88	69·9	46·9	0·2	10·2	0·062	15·7	wP : wP
20	..	29·257	54·9	47·1	7·8	49·3	+10·0	46·5	43·5	5·8	9·6	3·4	81	102·0	44·0	5·4	10·3	0·193	11·7	wP : vP, wN
21	..	29·561	53·0	39·2	13·8	46·2	+ 6·7	44·3	42·1	4·1	10·4	0·9	87	96·5	34·5	5·2	10·3	0·141	10·5	wP : mP
22	..	29·632	41·7	33·7	8·0	38·5	− 1·1	37·9	37·1	1·4	4·4	0·0	95	60·4	28·0	0·4	10·4	0·053	0·0	sP : vP
23	..	29·811	40·4	34·7	5·7	38·2	− 1·5	37·9	37·5	0·7	2·8	0·0	98	44·0	26·5	0·0	10·5	0·278	0·0	vN, vP : wN, wP
24	..	30·102	39·8	36·5	3·3	38·0	− 1·8	36·2	33·8	4·2	7·8	0·5	85	52·3	35·0	0·0	10·5	0·000	0·0	wP : mP
25	..	30·212	48·8	28·4	20·4	39·2	− 0·7	37·1	34·4	4·8	11·6	0·0	83	98·0	20·1	3·3	10·6	0·000	0·5	mP : mP
26	Full In Equator.	29·786	50·2	37·4	12·8	42·9	+ 2·9	39·5	35·4	7·5	14·5	2·5	75	88·1	33·5	2·4	10·7	0·003	1·5	wP : vP
27	..	29·670	49·4	35·0	14·4	41·1	+ 1·0	38·3	34·8	6·3	11·1	2·5	79	92·3	30·5	2·9	10·7	0·001	1·5	mP : mP
28	..	29·402	52·4	41·6	10·8	46·6	+ 6·4	44·6	42·4	4·2	7·2	1·3	86	93·2	38·9	1·2	10·8	0·020	6·0	wP : wP
29	..	29·470	51·7	42·1	9·6	46·5	+ 6·3	44·5	42·3	4·2	6·6	1·8	86	78·6	38·1	1·1	10·8	0·000	6·2	wP : mP
Means	..	29·636	48·0	36·6	11·4	42·1	+ 2·4	40·5	38·7	3·4	7·8	0·7	88·4	74·8	31·4	1·8	10·0	Sum 2·357	5·0	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The results apply to the civil day.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on February 4, 9, 10, and 28 for Air Temperature, and on February 28 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, and 15 are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was 29in·636, being 0in·196 *lower* than the average for the 20 years, 1854–1873.

Temperature of the Air.

The highest in the month was 54°·9 on February 20; the lowest in the month was 23°·0 on February 2; and the range was 31°·9.

The mean of all the highest daily readings in the month was 48°·0, being 2°·6 *higher* than the average for the 39 years, 1841–1879.

The mean of all the lowest daily readings in the month was 36°·6, being 2°·3 *higher* than the average for the 39 years, 1841–1879.

The mean daily range was 11°·4, being 0°·3 *greater* than the average for the 39 years, 1841–1879.

The mean for the month was 42°·1, being 2°·4 *higher* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1880.	Wind as deduced from Self-registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
Feb. 1	SW	SW : Calm	0·0	0·0	0·0	75	0, tk.-f, ho.-fr : 0, tk.-f, ho.-fr	1, ci, f : 0, ho.-fr
2	SW : SE : Calm	SW : SSW	0·0	0·0	0·0	158	f, ho.-fr : 3, th.-cl, f, ho.-fr	6, th.-cl : 10, m.-r
3	SSW : S	SSW : SW	0·0	0·0	0·0	119	10 : 10	10 : 10
4	SW : S : NW	SW	0·0	0·0	0·0	74	10 : 0, slt.-f, ho.-fr	0, tk.-f : 0, ho.-fr
5	SW : W	SSW	0·3	0·0	0·0	214	0, f : 0, m, f	v, ci, ci.-cu : 10, th.-r
6	SSW	SSW	3·8	0·0	0·2	357	10 : 10, th.-r	10, th.-r : 10, fq.-th.-r
7	SSW	S	4·7	0·0	0·6	411	10 : 10, fq.-r	10, fq.-r : 10, oc.-r, sc, w
8	S : SW : WNW	WSW : SSW : S	4·4	0·0	0·3	277	10, r : 10, r	10, slt.-sh : v, r, hl : 0
9	SSE : S	S : SSW : SW	6·3	0·0	1·3	544	slt.-r : 10, slt.-r	v, cu.-s, ci.-cu, slt.-r, w : 10, fq.-r, w
10	WSW	S : ENE : NE	..	..	..	276	w : 9, th.-cl, so.-ha	v, th.-cl : 0 : v, ho.-fr
11	NE : N	NNW : NW : SSW	..	..	..	183	10 : 10	10 : v
12	S : SSE : SW	WSW	..	..	..	365	0 : 10, th.-r	5, th.-cl, cu.-s, ci.-cu : 0
13	SW	SW : SSE	..	..	..	238	0, ho.-fr : 0	1, cu, th.-cl : 1, th.-cl : 6, ho.-fr
14	SSE	S	..	..	..	360	p.-cl : 10, fq.-th.-r	10, r : 10, oc.-shs
15	SSW : SSE	SE : SSE	..	..	..	293	10 : 10	10, cu.-s, ci.-cu : 10, fq.-r : 10, r
16	SSE : SE	S : SW	..	..	..	487	10. fq.-r : 10, c.-r	10, fq.-r, w : 8, th.-cl, w, lu.-ha, r
17	SE: SW: WNW: WSW	SW : S	..	..	..	445	10, r : 10	7, cu.-s, ci.-cu, ci.-s, ci : v, li.-cl : 1, ci.-cu, d
18	SSW : SW	SW : SSW	..	..	..	517	p.-cl, w : 10, r, w	8, ci, cu.-s, ci.-cu, sc : 10, r, w : 10, r, w
19	SW	SW	..	..	..	704	10, w : 10, shs.-r, st.-w	10, shs.-r, w : 10, shs.-r, w
20	SW	WSW	..	..	..	726	v, st.-w : 2, ci.-cu, slt.-r, st.-w	v, shs.-r, w : v, sc, ci.-cu, hy.-r, hl : 7, sc, ci.-cu
21	WSW	SW	..	..	..	356	p.-cl : v, ci.-s	9, cu.-s, ci.-cu, ci.-s : v, hy.-r, hl : 3, ci.-s, ci
22	SW : Calm	Variable : Calm	..	..	..	87	p.-cl : 7, ci.-cu, ci, f	10, f, glm : v, ci.-cu, ho.-fr, r
23	N	N : NNE	..	..	..	262	10, hy.-r : 10, r	10, oc.-r : 10, r
24	N : NNE	NNE	..	..	..	275	10 : 10	10 : 10
25	N : SW	WSW	..	..	..	210	ho.-fr : th.-cl, ho.-fr, so.-ha	4, th.-cl : 4, th.-cl, lu.-ha
26	WSW	NW : W	..	..	..	557	p.-cl : 10, shs.-r	8, cu.-s, ci.-cu : 4, ci.-cu, th.-cl
27	W : WSW	W : WSW	5·5	0·0	0·7	465	p.-cl : 7, cu.-s, ci.-cu, ci.-s	8, cu.-s, ci.-cu, ci : 9, cu.-s, ci.-cu
28	SW	WSW	6·0	0·0	1·2	515	v, slt.-r : 7, ci.-cu, ci	10 : 2, ci.-s
29	WSW	SW	6·5	0·0	0·6	495	p.-cl : 10	10 : v
Means	...	...	..	..	0·4 (12 dys.)	346		
Number of Column for Reference.	21	22	23	24	25	26	27	28

The mean *Temperature of Evaporation* for the month was 40°·5, being 2°·6 *higher* than
The mean *Temperature of the Dew Point* for the month was 38°·7, being 3°·3 *higher* than
The mean *Degree of Humidity* for the month was 88·4, being 3·6 *greater* than
The mean *Elastic Force of Vapour* for the month was $0^{in}\cdot235$, being $0^{in}\cdot028$ *greater* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was $2^{grs}\cdot7$, being $0^{gr}\cdot3$ *greater* than
The mean *Weight of a Cubic Foot of Air* for the month was 547 grains, being 7 grains *less* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 6·9.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·18. The maximum daily amount of *Sunshine* was 7·3 hours on February 13.

The highest reading of the *Solar Radiation Thermometer* was 102°·0 on February 20; and the lowest reading of the *Terrestrial Radiation Thermometer* was 18°·0 on February 2.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 3·0; for the 6 hours ending 3 p.m., 1·0; and for the 6 hours ending 9 p.m., 1·0.

The *Proportions of Wind* referred to the cardinal points were N. 3, E. 1, S. 13, and W. 11. One day was calm.

The *Pressure* apparatus was not in action during a considerable portion of the month of February. The mean daily *Horizontal Movement of the Air* for the month was 346 miles; the greatest daily value was 726 miles on February 20; and the least daily value 74 miles on February 4.

Rain fell on 18 days in the month, amounting to $2^{in}\cdot357$, as measured in the simple cylinder gauge partly sunk below the ground; being $0^{in}\cdot913$ *greater* than the average fall for the 39 years, 1841–1879.

MONTH and DAY, 1880.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	TEMPERATURE. Of the Air. Lowest.	TEMPERATURE. Of the Air. Daily Range.	TEMPERATURE. Of the Air. Mean of 24 Hourly Values.	TEMPERATURE. Of the Air. Excess of Mean above Average of 20 Years.	TEMPERATURE. Of Evaporation. Mean of 24 Hourly Values.	TEMPERATURE. Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Greatest of 24 Hourly Values.	Difference between the Air Temperature and Dew Point Temperature. Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	TEMPERATURE. Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	hours.	hours.	in.		
Mar. 1	..	29·272	53·0	36·9	16·1	45·9	+ 5·6	42·9	39·5	6·4	15·7	2·5	79	100·6	33·5	3·2	10·8	0·154	14·0	wP, wN : wP, vN
2	Perigee	29·227	51·5	36·8	14·7	45·4	+ 5·0	42·8	39·8	5·6	7·8	3·8	81	85·1	33·0	0·5	10·9	0·001	15·5	wP : wP
3	Last Qr.	29·185	53·1	47·9	5·2	50·3	+ 9·8	47·7	45·0	5·3	9·0	1·7	82	77·2	44·9	0·7	11·0	0·257	7·5	wP : mP
4	Greatest Declination S	29·629	56·9	45·2	11·7	50·0	+ 9·5	45·7	41·2	8·8	14·4	1·3	72	96·1	40·3	4·8	11·1	0·002	3·5	mP : mP
5	..	29·890	60·5	49·4	11·1	53·6	+13·1	50·7	47·9	5·7	9·7	2·0	81	108·8	47·1	2·6	11·1	0·000	5·5	wP : wP
6	..	29·973	54·7	43·5	11·2	49·1	+ 8·6	45·7	42·0	7·1	11·6	3·8	77	95·0	38·3	1·9	11·2	0·001	5·7	mP : mP
7	..	29·958	54·3	44·0	10·3	48·9	+ 8·3	47·9	46·8	2·1	5·6	0·0	93	94·2	38·8	0·3	11·2	0·074	5·5	mP : mP, wN
8	..	30·271	49·1	39·8	9·3	43·7	+ 3·1	42·1	40·2	3·5	7·1	0·4	87	92·0	38·8	1·8	11·3	0·000	4·0	wP : mP
9	..	30·111	59·5	40·0	19·5	47·3	+ 6·6	45·2	42·9	4·4	12·7	0·0	86	110·7	35·6	4·9	11·4	0·000	0·0	mP : wP
10	In Equator	30·018	58·3	39·5	18·8	48·3	+ 7·6	45·5	42·5	5·8	17·1	0·2	81	106·8	31·7	6·0	11·4	0·000	0·0	wP : mP
11	New	30·214	53·5	33·6	19·9	42·4	+ 1·6	41·6	40·6	1·8	9·8	0·0	94	111·8	27·2	6·1	11·5	0·000	3·0	mP : mP
12	..	30·182	51·3	39·8	11·5	44·4	+ 3·6	43·5	42·5	1·9	6·7	0·0	93	107·9	39·1	4·2	11·6	0·000	8·0	mP : mP
13	..	30·135	59·6	39·0	20·6	48·1	+ 7·2	45·3	42·2	5·9	16·7	0·0	81	115·2	31·0	8·5	11·6	0·000	0·5	wN, mP : vP
14	..	30·097	46·1	38·0	8·1	41·3	+ 0·3	40·8	40·2	1·1	3·3	0·0	96	66·0	32·2	0·0	11·7	0·002	3·2	vP : mP
15	..	30·074	46·1	37·0	9·1	41·6	+ 0·5	40·2	38·4	3·2	6·4	0·2	89	76·0	30·0	2·4	11·8	0·000	5·2	wP : mP
16	..	29·931	47·8	35·2	12·6	40·0	− 1·2	38·8	37·2	2·8	7·1	0·3	90	99·3	31·1	2·3	11·8	0·000	2·5	mP : mP
17	Apogee	29·971	49·7	36·0	13·7	42·0	+ 0·7	39·8	37·1	4·9	12·2	0·5	84	110·0	30·0	10·3	11·9	0·000	5·5	mP : sP
18	Greatest Declination N	30·154	52·1	32·9	19·2	41·9	+ 0·5	38·6	34·5	7·4	19·4	0·0	77	110·4	22·4	10·1	12·0	0·000	1·0	sP : sP
19	First Qr.	30·184	55·2	35·1	20·1	43·2	+ 1·8	41·0	38·4	4·8	14·0	0·0	83	113·8	28·1	7·1	12·0	0·000	5·0	mP : sP
20	..	30·118	48·6	32·8	15·8	38·8	− 2·7	37·7	36·2	2·6	9·9	0·0	91	110·2	32·8	5·6	12·1	0·000	11·0	vP : sP
21	..	30·118	50·6	33·1	17·5	40·9	− 0·7	38·1	34·6	6·3	14·3	0·0	78	103·5	27·8	10·0	12·2	0·000	4·0	mP : sP
22	..	30·153	44·2	32·7	11·5	38·5	− 3·2	36·6	34·0	4·5	7·9	0·8	84	61·8	29·0	0·0	12·2	0·000	5·0	vP, wN : sP
23	..	30·156	45·1	32·0	13·1	37·9	− 3·9	35·8	33·0	4·9	12·5	0·0	82	107·0	26·0	5·0	12·3	0·001	4·0	sP : mP
24	..	30·100	55·3	28·8	26·5	41·3	− 0·7	37·8	33·4	7·9	21·8	0·0	74	116·8	18·0	10·2	12·4	0·000	0·0	sP : sP
25	In Equator	29·947	60·7	33·7	27·0	45·9	+ 3·6	41·7	36·9	9·0	21·8	0·0	72	115·9	26·6	10·4	12·4	0·000	3·7	ssP : sP
26	Full	29·887	61·4	37·0	24·4	47·3	+ 4·7	42·1	36·3	11·0	25·5	0·7	66	113·4	30·8	10·4	12·5	0·000	6·3	sP : sP
27	..	29·976	48·1	34·0	14·1	39·7	− 3·3	38·3	36·5	3·2	8·4	0·0	89	85·0	27·6	2·2	12·6	0·002	7·8	vP, wN : mP
28	..	30·004	48·3	33·0	15·3	39·2	− 4·2	37·4	35·1	4·1	9·4	0·0	86	106·2	27·0	2·6	12·6	0·000	10·3	vP : ssP
29	Perigee	29·870	55·5	27·4	28·1	41·6	− 2·2	38·4	34·5	7·1	17·6	0·0	77	98·3	23·1	4·1	12·7	0·000	0·0	sP : vN, vP
30	..	29·790	59·2	38·5	20·7	46·2	+ 1·9	42·5	38·3	7·9	16·7	1·6	75	112·0	33·0	2·3	12·8	0·000	0·5	vP : vP
31	Greatest Declination S	29·395	57·4	31·6	25·8	45·3	+ 0·5	42·5	39·3	6·0	15·2	0·0	79	94·2	24·3	0·5	12·8	0·101	8·5	mP : sN, wP
Means	..	29·935	53·1	36·9	16·2	44·2	+ 2·6	41·8	38·9	5·3	12·5	0·6	82·5	100·0	31·6	4·5	11·8	Sum 0·595	5·0	....
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The results apply to the civil day.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers.

The values given in Columns 3, 4, 5, 14, and 15 are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was 29^{in}·935, being 0^{in}·213 *higher* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 61°·4 on March 26; the lowest in the month was 27°·4 on March 29; and the range was 34°·0.
The mean of all the highest daily readings in the month was 53°·1, being 3°·3 *higher* than the average for the 39 years, 1841–1879.
The mean of all the lowest daily readings in the month was 36°·9, being 1°·7 *higher* than the average for the 39 years, 1841–1879.
The mean daily range was 16°·2, being 1°·6 *greater* than the average for the 39 years, 1841–1879.
The mean for the month was 44°·2, being 2°·6 *higher* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1880.	Wind as deduced from Self-registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
Mar. 1	SSW : SW	WSW	12·5	0·0	2·2	634	v, w : 9,cu.-s,ci.-cu,slt.-r,st.-w	7,cu.-s,ci.-cu,ci.-s,shs.-r: 10, shs.-r, sqs
2	SW	WSW : SW	35·+	1·2	6·7	954	10, st.-w : 10, g	10,hy.-g,slt.-r: 10,fq.-th.-r,hy.-g: 9, g
3	WSW	SW	32·0	0·8	4·3	754	10, r, st.-w : 10, st.-w	9, cu.-s, ci.-cu, w : v, w
4	WSW	W : WSW	16·5	0·0	3·0	635	st.-w : 5, ci.-cu, th.-cl, w	9,ci.-cu,th.-cl,w: 10, m.-r : 10
5	WSW	WSW	9·5	0·2	2·5	600	10, w : 10, w	9,ci.-cu,th.-cl,w: 10, sqs : 10
6	SW	SW : SSW	3·2	0·0	0·3	360	10 : 10	9, ci.-cu, ci, ci.-s: v : 1, cu.-s
7	SSW: SW: WSW	Calm	0·8	0·0	0·0	143	p.-cl : 8,cu.-s,ci.-cu,ci,th.-r,glm	10, gt.-glm, fq.-r : 10, fq.-r
8	NE	ENE	3·3	0·0	0·6	358	10 : 10	9,cu.-s,ci.-cu: 10 : 10
9	ENE	SSE : SE	0·4	0·0	0·0	166	10 : vv, cu.-s, ci.-cu	v,cu.-s,ci.-cu: 3,cu.-s,ci.-cu: 2
10	SE : SW	W : WNW : SW	1·1	0·0	0·1	160	slt.-f : 10, slt.-f	3,ci.-cu,cu.-s,ci: 0 : 0
11	Calm : NE	E	..	..	..	205	0, f : 0, tk.-f	2,ci.-cu,th.-cl: 10 : 10
12	E	E	..	..	..	254	10 : 10	4, cu.-s, ci.-cu, ci : 10
13	Calm : NNE	NNE: NE: ESE	..	..	..	144	v : 1, th.-cl, so.-ha	7,ci,ci.-s,li.-cl: v, ci : 0
14	E : ENE	ENE : E	0·0	0·0	0·0	141	v : 10	10 : v, ci : 1, ci, d
15	E : ENE	E : ENE	1·2	0·0	0·1	278	p.-cl : 10	10 : v : 0, d
16	NE : ENE	E : ENE	2·0	0·0	0·2	275	10 : 10	7,cu.-s,ci.-cu,ci: 10 : 10
17	ENE : E	E : ENE	4·5	0·0	0·6	316	v : 6, ci.-cu, ci	2, ci.-s : 0 : 0
18	ENE : E	E	8·5	0·0	0·9	304	0, ho.-fr : 0, ho.-fr	0, w : 0
19	ENE : E	ESE : E	1·5	0·0	0·1	238	v, ci.-cu, cu.-s : v	1, ci.-cu : 0 : 10
20	E : ENE	E	5·5	0·0	0·4	253	10 : 10, f	2, cu.-s : 10
21	ENE : E	ENE	4·0	0·0	0·4	312	v, cu.-s : 6, cu.-s	7, cu.-s : 0
22	NE	ENE	1·5	0·0	0·1	266	v : 10, slt.-r	10, slt.-r : 9
23	NE : ENE	ENE : NE	5·5	0·0	0·6	303	10 : 10	v,cu.-s,ci.-cu: 0 : 0, ho.-fr
24	NE : ENE	E	2·8	0·0	0·3	243	0, ho.-fr : 0, ho.-fr	0 : 0
25	ENE : E	E	4·0	0·0	0·3	274	0 : 0	0 : 0
26	ENE	E : ENE	4·0	0·0	0·3	269	0 : 1, ci.-cu	2, ci, ci.-s : 0
27	NNE : NE	ENE	1·3	0·0	0·1	302	p.-cl : 10	8, cu.-s : 10
28	NE	SE : SSE	0·0	0·0	0·0	144	10 : 10	1, th.-cl : 0
29	Calm : S	Calm : SW	0·0	0·0	0·0	83	0, f : f	10, th.-cl, h, f : p.-cl,cu.-s,ci.-cu,h,f: 2
30	WSW : N	NE : E : ESE	..	..	..	161	p.-cl : 9, th.-cl, slt.-f	9,cu.-s,ci.-cu: v : 0
31	SE : S	SW	..	..	..	407	p.-cl : 9, ci, ci.-s, so.-ha	10, w, slt.-r : 10, r
Means	...	...	..	..	0·9 (26 dys)	321		
Number of Column for Reference.	21	22	23	24	25	26	27	28

The mean *Temperature of Evaporation* for the month was 41°·8, being 2°·8 *higher* than
The mean *Temperature of the Dew Point* for the month was 38°·9, being 2°·9 *higher* than
The mean *Degree of Humidity* for the month was 82·5, being 1·6 *greater* than
The mean *Elastic Force of Vapour* for the month was 0^{in}·237, being 0^{in}·025 *greater* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 2^{grs}·7, being 0^{gr}·2 *greater* than
The mean *Weight of a Cubic Foot of Air* for the month was 550 grains, being *the same as*
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 6·1.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·38. The maximum daily amount of *Sunshine* was 10·4 hours on March 25 and 26.

The highest reading of the *Solar Radiation Thermometer* was 116°·8 on March 24; and the lowest reading of the *Terrestrial Radiation Thermometer* was 18°·0 on March 24.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 3·2; for the 6 hours ending 3 p.m., 1·0; and for the 6 hours ending 9 p.m., 0·8.

The *Proportions of Wind* referred to the cardinal points were N. 5, E. 16, S. 4, and W. 5. One day was calm.

The *Greatest Pressure of the Wind* in the month was 35^{lbs}·+ on the square foot on March 2. The mean daily *Horizontal Movement of the Air* for the month was 321 miles; the greatest daily value was 954 miles on March 2; and the least daily value 83 miles on March 29.

Rain fell on 4 days in the month, amounting to 0^{in}·595, as measured in the simple cylinder gauge partly sunk below the ground; being 0^{in}·873 *less* than the average fall for the 39 years, 1841–1879.

MONTH and DAY, 1880.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Lowest.	Daily Range.	Mean of 24 Hourly Values.	Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	hours.	hours.	in.		
Apr. 1	..	29·392	54·1	39·9	14·2	45·2	− 0·1	41·9	38·1	7·1	13·9	1·3	76	100·8	34·5	7·2	12·9	0·151	4·0	wN, vP : sN, sP
2	Last Qr.	29·388	52·4	39·1	13·3	45·7	0·0	44·8	43·8	1·9	5·4	0·0	94	67·2	34·8	0·1	13·0	0·294	10·5	sP, wN : wN, sP
3	..	29·397	62·4	46·9	15·5	52·3	+ 6·2	49·7	47·1	5·2	11·8	1·1	83	116·5	43·0	6·3	13·0	0·000	8·7	sP : mP
4	..	29·217	56·9	42·1	14·8	50·2	+ 3·8	47·8	45·3	4·9	11·8	0·4	84	100·0	37·0	1·4	13·1	0·023	8·2	mP : sP
5	..	29·283	54·5	39·0	15·5	45·4	− 1·2	43·1	40·5	4·9	9·4	3·1	83	111·5	35·0	6·5	13·2	0·313	11·0	mP, wN : wN, vP
6	..	29·163	52·5	38·0	14·5	43·7	− 3·0	41·7	39·4	4·3	11·0	1·1	85	74·3	32·3	1·0	13·2	0·040	12·5	mP : vP
7	In Equator	29·366	59·2	36·5	22·7	44·5	− 2·3	42·7	40·6	3·9	11·8	0·0	87	121·8	31·2	3·6	13·3	0·006	0·0	sP : mN, vP
8	..	29·730	56·4	35·1	21·3	44·7	− 2·1	43·3	41·7	3·0	11·6	0·0	89	121·0	27·9	3·8	13·4	0·014	0·2	vP : vP, wN
9	New	30·048	48·9	40·0	8·9	43·1	− 3·8	40·8	38·1	5·0	10·5	0·9	82	81·5	34·0	0·5	13·4	0·000	7·5	vP : vP, wN
10	..	29·994	46·9	38·1	8·8	41·4	− 5·5	39·2	36·5	4·9	9·2	1·6	83	80·8	34·3	0·5	13·5	0·016	6·0	sN, vP : vP
11	..	29·806	50·8	37·0	13·8	41·6	− 5·4	39·8	37·5	4·1	9·0	0·7	87	102·8	35·2	2·4	13·6	0·026	6·7	mN, mP : sN, mP
12	..	29·722	52·0	35·8	16·2	43·4	− 3·7	41·3	38·8	4·6	11·8	0·0	84	110·2	29·8	6·3	13·6	0·000	5·5	mP : vP
13	..	29·707	59·2	38·7	20·5	49·2	+ 2·0	45·5	41·6	7·6	18·8	0·0	75	116·7	31·9	0·8	13·7	0·003	4·0	vP : mP, wN
14	Apogee Greatest Dec. N	29·549	48·0	44·4	3·6	46·3	− 1·1	45·8	45·2	1·1	2·3	0·0	97	79·0	43·0	0·0	13·7	0·604	0·8	vN, wP : sN, vP
15	..	29·508	47·3	41·7	5·6	44·9	− 2·6	44·7	44·5	0·4	2·1	0·0	98	59·9	37·0	0·0	13·8	0·345	12·5	vN, vP : vN, vP
16	..	29·623	57·9	40·4	17·5	48·1	+ 0·5	45·1	41·8	6·3	12·4	0·7	79	117·0	34·7	7·0	13·9	0·000	12·0	mP : mP
17	First Qr.	29·704	63·4	39·1	24·3	51·2	+ 3·4	46·6	41·8	9·4	18·2	1·5	71	119·2	31·9	8·4	13·9	0·000	5·0	mP : vP
18	..	29·850	61·3	38·1	23·2	51·6	+ 3·7	47·8	43·9	7·7	16·0	0·0	75	120·0	30·3	9·8	14·0	0·000	9·5	sP : mP
19	..	29·758	66·9	51·6	15·3	57·7	+ 9·7	50·7	44·3	13·4	20·7	6·6	61	125·7	45·5	9·4	14·1	0·000	10·3	wP : sP
20	..	29·717	63·1	45·0	18·1	52·8	+ 4·7	49·6	46·4	6·4	15·2	1·0	79	122·2	40·0	5·9	14·1	0·277	4·0	sN, vP : vP, mN
21	In Equator	29·829	59·4	42·0	17·4	50·2	+ 2·0	47·0	43·6	6·6	12·5	0·4	79	111·8	36·8	5·5	14·2	0·000	15·2	mP : vP
22	..	29·669	60·0	41·4	18·6	50·3	+ 2·1	46·6	42·7	7·6	16·2	1·9	76	105·4	35·2	2·8	14·2	0·018	8·8	mP : sN, vP
23	..	29·880	62·1	38·8	23·3	50·5	+ 2·2	45·8	40·9	9·6	19·0	0·0	70	117·5	32·7	8·7	14·3	0·000	0·0	vP, wN : wN, vP
24	Full	29·863	60·1	42·8	17·3	51·0	+ 2·7	47·7	44·2	6·8	11·4	1·3	78	97·0	38·6	1·9	14·4	0·002	1·0	vP : wN, vP
25	..	29·794	58·5	40·5	18·0	50·2	+ 1·8	45·1	39·7	10·5	18·0	2·3	68	108·8	30·0	10·1	14·4	0·000	3·0	mP : vP
26	Perigee	29·854	50·0	37·8	12·2	43·0	− 3·4	40·7	38·0	5·0	13·0	1·4	82	92·8	26·4	2·8	14·5	0·062	0·0	vP : wN, vP
27	Greatest Declination S	29·993	50·5	34·8	15·7	42·5	− 3·9	39·5	35·9	6·6	13·4	1·4	78	109·0	29·9	5·5	14·5	0·005	4·0	vP : vP
28	..	29·915	50·1	38·9	11·2	44·9	− 3·6	42·5	39·7	5·2	8·8	0·2	82	71·0	34·4	0·1	14·6	0·006	4·0	mP : vP
29	..	30·083	54·4	37·3	17·1	45·3	− 3·2	40·7	35·4	9·9	17·0	3·5	69	123·3	31·0	6·6	14·7	0·000	13·8	mP : vP
30	..	30·210	58·0	35·5	22·5	46·0	− 2·0	41·8	37·0	9·0	16·3	1·7	72	128·5	26·5	7·6	14·7	0·000	4·3	sP : vP
Means	..	29·700	55·9	39·9	16·0	47·2	− 0·2	44·3	41·1	6·1	12·6	1·1	80·2	103·8	34·2	4·4	13·8	2·205	6·4	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The results apply to the civil day.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers.

The values given in Columns 3, 4, 5, 14, and 15 are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was 29$^{\text{in}}$·700, being 0$^{\text{in}}$·103 *lower* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 66°·9 on April 19; the lowest in the month was 34°·8 on April 27; and the range was 32°·1.

The mean of all the highest daily readings in the month was 55°·9, being 1°·8 *lower* than the average for the 39 years, 1841–1879.

The mean of all the lowest daily readings in the month was 39°·9, being 0°·7 *higher* than the average for the 39 years, 1841–1879.

The mean daily range was 16°·0, being 2°·5 *less* than the average for the 39 years, 1841–1879.

The mean for the month was 47°·2, being 0°·2 *lower* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1880.	Wind as deduced from Self-registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
April 1	NW	W	..	..	..	479	10, r : 6, ci.-cu, cu.-s	7, cu.-s, ci.-cu, oc.-shs, hl: 0
2	W : SW	SW : WSW	..	..	..	382	0 : v, r	10, r : v : 0
3	WSW	WSW	..	..	..	395	0 : 8, cu.-s, ci.-cu, ci, cu	8, cu.-s, ci.-cu : 8
4	WSW : SW	W	..	..	..	417	10 : 10, oc.-slt.-r	v, cu.-s, ci.-cu, shs.-r : 2
5	W : SW	SW	..	..	..	468	p.-cl : 8, cu.-s, ci.-cu, hy.-r. hl	v, cu.-s, ci.-cu, s, r : 0
6	S : SW	WNW : SW	5·5	0·0	0·0	190	v : 10	9, cu.-s, ci.-cu: p.-cl, r, glm, t: 0
7	SW : WSW	SW : SSE : S	1·4	0·0	0·0	172	v : 10	6, cu.-s, ci.-cu, shs.-r, t: 2, th.-cl
8	Calm : NE	NE : NNE	2·3	0·0	0·0	194	p.-cl : 10, slt.-f	6, cu.-s, ci.-cu, cu, r, t : 0, d
9	NNE	NNE	6·5	0·0	1·4	487	p.-cl : 10	10 : 10, slt.-r
10	NNE	NE	5·6	0·0	0·8	400	10 : 10, li.-shs	10, slt.-r : 10, slt.-r
11	NE	E : ENE	1·5	0·0	0·1	256	10 : 10, r	10, li.-shs : 10
12	NE	ENE	1·0	0·0	0·1	219	10 : 8, cu.-s, ci.-cu	8, ci, ci.-cu, th.-r : 10, slt.-r
13	ENE	SSE : S : NNE	0·2	0·0	0·0	118	10 : 9, ci.-cu, ci.-s	10 : 10, m, slt.-r
14	NE	NE : N	0·3	0·0	0·0	201	10, r : 10, c.-r	10, hy.-r : 10, fq.-th.-r
15	NE : ENE	E : ESE : SSW	7·0	0·0	0·4	301	10, r : 10	10, r : 10 : 10
16	SSE : SSW	SSW : S	5·3	0·0	0·5	318	10 : 8, cu.-s, ci.-cu	7, cu.-s, ci.-cu, ci.-s, ci: 0, d
17	SSE	SSW : S : SW	2·2	0·0	0·1	243	0 : 0 : v, cu.-s	8, cu.-s, th.-cl : 8
18	SSW	SSW	3·6	0·0	0·6	366	p.-cl : v, ci.-cu	5, cu.-s, ci.-cu : 10
19	SSW : SSE : S	S : SSE : SSW	..	..	..	342	p.-cl : 4, ci.-s, ci.-cu	6, ci, ci.-s, ci.-cu : 6, cu.-s, t, slt.-r
20	WSW	WSW	..	..	..	273	10, hy.-r : 10	7, ci.-cu, cu, cu.-s: v, sh.-r : 0
21	WSW	SW : SSW	..	..	..	481	0 : 4, ci.-s, ci	10 : 10 : 2, ci.-cu, ci.-s
22	SSW : SW	WSW : WNW	..	..	..	336	p.-cl : 10	9, cu.-s, ci.-cu, ci.-s, n, hy.-shs, hl: v, ci.-cu
23	WSW : W	W : WSW	..	..	..	246	p.-cl : 10, th.-cl, h	7, cu.-s, ci.-cu: 8, cu.-s : 2, th.-cl, lu.-ha
24	WSW	WSW	..	..	..	399	v : 10	10 : 10, th.-r
25	WSW : NNW	NNW : NNE	..	..	..	208	10 : 7, cu.-s	8, cu.-s : 1
26	NNE : N	NNE	..	..	..	318	v : 10, fq.-th.-r	9, cu.-s, ci.-cu : vv, sh.-r
27	NNE	NNE : NE	..	..	..	476	10 : 10, oc.-shs	9, cu.-s, ci.-cu, sh.-r : 0
28	NNE : NE	NE : NNE	..	..	..	475	p.-cl : 10	10, th.-r : 10, oc.-th.-r
29	NNE : NE	ENE : NE	..	..	..	498	10 : 10, ci.-cu, cu.-s	6, ci.-cu, cu.-s : 0
30	NNE : NE	ENE : E	..	..	..	320	v : 10, th.-r	4, cu.-s, ci.-cu: 0 : 0
Means	...	...	..	..	0·3 lbs.	333		
Number of Column for Reference.	21	22	23	24	25	26	27	28

The mean *Temperature of Evaporation* for the month was 44°·3, being 0°·4 *higher* than
The mean *Temperature of the Dew Point* for the month was 41°·1, being 0°·8 *higher* than
The mean *Degree of Humidity* for the month was 80·2, being 3·3 *greater* than
The mean *Elastic Force of Vapour* for the month was 0in·258, being 0in·008 *greater* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 3grs·0, being 0gr·1 *greater* than
The mean *Weight of a Cubic Foot of Air* for the month was 543 grains, being 1 grain *less* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 7·4.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·32. The maximum daily amount of *Sunshine* was 10·1 hours on April 25.

The highest reading of the *Solar Radiation Thermometer* was 128°·5 on April 30; and the lowest reading of the *Terrestrial Radiation Thermometer* was 26°·4 on April 26.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 3·4; for the 6 hours ending 3 p.m., 1·9; and for the 6 hours ending 9 p.m., 1·1.

The *Proportions of Wind* referred to the cardinal points were N. 8, E. 6, S. 8, and W. 8.

The *Pressure* apparatus was not in action during a considerable portion of the month of April. The mean daily *Horizontal Movement of the Air* for the month was 333 miles; the greatest daily value was 498 miles on April 29; and the least daily value 118 miles on April 13.

Rain fell on 16 days in the month, amounting to 2in·205, as measured in the simple cylinder gauge partly sunk below the ground; being 0in·544 *greater* than the average fall for the 39 years, 1841–1879.

MONTH and DAY, 1880.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Lowest.	Daily Range.	Mean of 24 Hourly Values.	Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays, as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass, as shown by a Self-Registering Minimum Thermometer.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	hours.	hours.	in.		
May 1	Last Qr.	30·033	56·2	33·1	23·1	45·4	− 3·3	41·9	37·9	7·5	13·2	1·4	75	129·9	22·8	12·2	14·8	0·000	1·2	vP : sP
2	..	29·700	62·4	31·5	30·9	47·3	− 1·6	43·8	39·9	7·4	19·0	0·0	76	123·3	23·3	9·1	14·8	0·000	5·8	sP : mP
3	..	29·566	60·3	37·2	23·1	46·9	− 2·2	44·9	42·7	4·2	12·2	0·4	86	128·8	28·0	1·5	14·9	0·050	0·0	vP, wN : vN, mP
4	In Equator	29·758	56·1	44·8	11·3	49·0	− 0·4	46·0	42·8	6·2	9·6	2·6	79	98·9	39·0	1·0	14·9	0·000	0·0	mP : vP
5	..	29·851	49·8	43·7	6·1	46·5	− 3·2	44·4	42·0	4·5	8·2	1·1	85	65·1	43·0	0·0	15·0	0·120	0·0	vP, sN : mN, vP
6	..	29·854	58·7	43·6	15·1	48·3	− 1·7	44·6	40·6	7·7	16·7	0·9	75	115·7	33·2	4·7	15·1	0·000	0·8	vP : mP
7	..	29·940	53·2	39·5	13·7	46·4	− 3·9	41·2	35·3	11·1	16·8	4·0	66	117·5	27·5	7·3	15·1	0·000	2·2	vP : mP
8	..	29·970	56·1	38·4	17·7	46·6	− 4·0	41·6	36·0	10·6	19·6	2·9	67	120·8	28·0	3·7	15·2	0·000	2·0	vP : mP
9	New	30·091	55·1	36·1	19·0	46·2	− 4·6	41·6	36·4	9·8	15·6	2·4	70	101·7	27·8	5·3	15·2	0·000	7·0	sP : vP
10	..	29·934	50·3	35·7	14·6	44·8	− 6·3	42·1	39·0	5·8	9·7	2·2	80	75·8	26·0	0·0	15·3	0·000	0·0	sP, wN : vN, vP
11	Greatest Dec N Apogee	29·778	60·6	42·4	18·2	50·1	− 1·3	45·6	40·9	9·2	19·4	2·0	71	129·9	37·5	7·2	15·3	0·000	5·5	vP, wN : mP
12	..	29·851	61·2	42·6	18·6	51·1	− 0·7	45·9	40·5	10·6	19·2	2·4	67	126·2	35·5	9·3	15·4	0·000	11·2	mP, wN : vP
13	..	29·961	68·6	40·5	28·1	53·5	+ 1·4	48·5	43·6	9·9	18·5	1·8	69	132·0	35·1	11·2	15·4	0·000	2·3	vP : mP
14	..	29·941	74·4	44·3	30·1	58·0	+ 5·5	53·7	49·8	8·2	16·0	2·7	75	133·5	38·5	9·2	15·5	0·000	4·0	vP : mP
15	..	29·914	76·9	46·5	30·4	59·5	+ 6·6	54·2	49·5	10·0	21·2	1·3	69	138·9	40·5	8·5	15·5	0·000	10·2	vP : mP
16	..	29·971	66·3	42·1	24·2	53·4	+ 0·1	47·3	41·2	12·2	21·1	2·6	63	132·4	37·1	11·6	15·6	0·000	3·8	mP : mP
17	First Qr.	30·049	60·4	39·5	20·9	50·0	− 3·7	44·0	37·6	12·4	19·2	3·9	63	134·3	28·8	9·4	15·6	0·000	4·2	mP : wN, mP
18	..	30·084	60·1	37·0	23·1	48·5	− 5·6	43·0	37·0	11·5	20·3	1·4	64	141·7	25·7	9·7	15·7	0·000	11·8	mP : wP
19	In Equator	30·031	60·2	33·5	26·7	49·4	− 5·0	45·2	40·7	8·7	15·4	2·2	72	87·2	24·0	2·2	15·7	0·000	0·0	wP : wP, wN
20	..	30·025	72·0	48·0	24·0	58·8	+ 4·1	54·3	50·3	8·5	17·5	0·8	73	135·9	41·0	4·4	15·8	0·000	0·0	wP : wP, wN
21	..	30·010	77·7	47·0	30·7	61·3	+ 6·3	53·6	46·9	14·4	30·8	1·0	59	123·9	38·8	7·9	15·8	0·000	0·0	wP : wN, wP
22	..	29·697	65·1	49·0	16·1	56·4	+ 1·1	51·0	46·0	10·4	18·6	3·8	68	103·0	40·0	2·0	15·9	0·000	5·0	wP : wN, wP
23	..	29·741	62·4	46·7	15·7	54·5	− 1·0	50·1	45·8	8·7	14·4	4·0	72	112·0	41·3	1·6	15·9	0·000	1·8	mP : wN, wP
24	Full Perigee	29·738	66·8	50·7	16·1	57·6	+ 1·9	53·0	48·8	8·8	12·8	4·0	73	112·5	47·0	4·4	16·0	0·000	12·5	wP, wN : wN, vP
25	Greatest Declination S	29·880	74·4	48·0	26·4	60·4	+ 4·5	53·6	47·6	12·8	25·9	1·6	63	131·9	42·5	10·6	16·0	0·000	13·7	mP : wP
26	..	29·770	87·5	48·8	38·7	67·6	+11·5	56·6	47·9	19·7	35·0	7·0	49	142·8	38·2	8·3	16·0	0·000	3·7	vP
27	..	29·652	74·9	48·4	26·5	61·1	+ 4·8	55·8	51·2	9·9	16·9	2·4	71	141·9	44·5	5·5	16·1	0·025	6·3	wN, wP
28	..	30·053	65·8	46·3	19·5	53·9	− 2·6	47·7	41·6	12·3	24·5	2·3	63	123·4	38·5	10·0	16·1	0·000	0·0	mP : vN, mP
29	..	30·264	65·9	39·7	26·2	52·9	− 3·9	46·6	40·3	12·6	23·7	2·4	63	127·4	32·3	9·7	16·1	0·000	0·0	mP, wN : wN, mP
30	Last Qr.	30·140	69·4	38·8	30·6	54·0	− 3·0	47·8	41·7	12·3	21·4	0·0	63	134·2	26·6	5·3	16·2	0·000	6·0	mP : wP
31	In Equator	29·958	54·7	45·2	9·5	50·4	− 6·9	48·0	45·5	4·9	11·4	0·8	84	71·5	39·8	0·0	16·2	0·302	0·0	mP : vN, vP
Means	..	29·910	64·0	42·2	21·8	52·6	− 0·6	47·7	42·8	9·8	18·2	2·3	70·1	119·2	34·6	6·2	15·6	Sum 0·497	3·9	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The results apply to the civil day.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on May 2 and 14 for Air Temperature, and on May 2 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, and 15 are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was 29in·910, being 0in·133 *higher* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 87°·5 on May 26; the lowest in the month was 31°·5 on May 2; and the range was 56°·0.

The mean of all the highest daily readings in the month was 64°·0, being 0°·2 *lower* than the average for the 39 years, 1841–1879.

The mean of all the lowest daily readings in the month was 42°·2, being 1°·6 *lower* than the average for the 39 years, 1841–1879.

The mean daily range was 21°·8, being 1°·4 *greater* than the average for the 39 years, 1841–1879.

The mean for the month was 52°·6, being 0°·6 *lower* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1880.	WIND AS DEDUCED FROM SELF-REGISTERING ANEMOMETERS. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	CLOUDS AND WEATHER. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
May 1	NE : ENE	E : ESE	..	..	..	163	0 : 1, ci.-cu, ci.-s, m	4, cu.-s, ci.-cu : 0 : 0
2	NE : E	E : ESE	0·0	0·0	0·0	135	p.-cl : 4, ci.-cu	1, ci.-cu : 0
3	NE : NNE	NE : NNE	1·0	0·0	0·0	184	v : 10	9, cu.-s, ci.-cu, ci.-s, r, l, t : 7, cu.-s, ci.-cu
4	NNE : N	NNE : N	2·0	0·0	0·1	325	10 : 10	10 : 10
5	NNE : N	NNE	4·7	0·0	0·4	357	10 : 10, r	10, fq.-r : 10, m.-r
6	NNE : NE	NE : ESE	2·8	0·0	0·2	336	10 : 10	v, ci.-cu : 0
7	NE : NNE	NNE : NE	3·0	0·0	0·3	270	p.-cl : 7, ci.-cu, cu.-s	9, cu.-s : 0, m
8	Variable : NE	NE : ESE : NNE	1·2	0·0	0·0	150	v : 10	8, ci.-cu, cu.-s : 0, ho.-fr
9	N : NNE	NNE	2·5	0·0	0·2	313	p.-cl : 10	10 : 10
10	N : NNE	NNE : E	0·0	0·0	0·0	94	10 : 10, th.-r	10, fq.-th.-r : 10, oc.-th.-r
11	ENE : E	E : ENE	4·0	0·0	0·4	264	10 : 9, cu.-s, ci.-cu, li.-shs	6, cu.-s, ci.-cu, ci.-s : 3, ci.-cu
12	ENE	ENE : NE : NNE	9·0	0·0	1·4	430	p.-cl : 8, ci.-cu	4, ci.-cu, ci.-s, ci : 1, ci : 0
13	NNE	ENE : NE	3·7	0·0	0·3	338	0 : 1, ci	3, ci.-cu, ci : 2, li.-cl
14	NE : ENE	ENE : NE	4·2	0·0	0·1	326	p.-cl : 8, cu.-s, ci.-cu	3, ci.-cu, ci : 2, ci.-cu : 0
15	NNE	NE	5·0	0·0	0·6	404	v : 10	5, ci.-cu, cu.-s : p.-cl : 0
16	NNE : NE	NE	6·7	0·0	1·2	447	0 : 0	0 : 0
17	NE	ENE : NE	7·6	0·0	1·4	428	v : v, ci.-cu	2, ci, ci.-cu : 0
18	NNE : NE	NNE : NE	3·7	0·0	0·7	336	p.-cl : 8, cu.-s	5, cu.-s, ci : 0
19	NE : Calm : WSW	W : WNW : WSW : N	1·2	0·0	0·0	155	v : 10, th.-cl	10, th.-cl, th.-r : 10
20	NNE : N : NNW	N : Calm	1·0	0·0	0·0	154	10 : 9, cu.-s, ci.-cu, h	9, cu.-s, ci.-cu : 9
21	WSW : NW	NW : NNE	1·2	0·0	0·0	191	p.-cl : 7, ci.-cu, th.-cl, h	7, th.-cl, ci.-s, ci.-cu : 8, th.-cl
22	WSW	WNW : W	6·0	0·0	0·8	401	p.-cl : 8, ci.-cu, ci, th.-cl	10, cu.-s : 5, ci.-cu, cu.-s
23	W : WSW	WSW : SW	5·7	0·0	0·8	403	p.-cl : 9, cu.-s, ci.-cu, ci.-s	10 : 10
24	SW	SW : SSW	8·5	0·0	2·4	528	10 : 10	9, cu.-s, ci.-cu, slt.-r : 10, th.-r
25	SSW	SW : S	3·5	0·0	0·2	285	10 : v, ci.-cu, cu.-s, ci	1, ci, th.-cl : 1, th.-cl : 0
26	SSE : Calm : SSW	SW : SE	2·0	0·0	0·0	193	v : 7, ci.-s, ci	6, cu.-s, ci.-cu, ci.-s, ci : 9, cu.-s, t, l
27	NE : SSW : SW	SW : NNW : N	10·5	0·0	1·4	344	p.-cl : 9, cu.-s, ci.-cu	8, cu.-s, ci.-cu : 10, sh.-r, t : 10
28	WSW : W	WNW : W	6·3	0·0	0·4	330	p.-cl : 7, cu.-s, ci.-cu	6, cu.-s, ci.-cu, slt.-r, v : 0
29	WSW : NW	NNW : ENE : ESE	2·0	0·0	0·0	191	v : 7, ci.-cu, cu.-s, ci	7, ci.-cu, cu.-s : p.-cl : 0
30	E : SE : SW	SW : S	0·5	0·0	0·0	125	p.-cl : 6, cu.-s	8, cu.-s : 7, cu.-s, th.-cl
31	S : NE	N : NNE	0·0	0·0	0·0	113	v : 10, r	10, c.-r : v, ci.-cu
Means	...	...	..	..	0·4	281		
Number of Column for Reference.	21	22	23	24	25	26	27	28

The mean *Temperature of Evaporation* for the month was $47^{\circ}\cdot7$, being $1^{\circ}\cdot2$ *lower* than
The mean *Temperature of the Dew Point* for the month was $42^{\circ}\cdot8$, being $2^{\circ}\cdot3$ *lower* than
The mean *Degree of Humidity* for the month was 70·1, being 5·3 *less* than
The mean *Elastic Force of Vapour* for the month was $0^{in}\cdot275$, being $0^{in}\cdot026$ *less* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was $3^{grs}\cdot1$, being $0^{gr}\cdot3$ *less* than
The mean *Weight of a Cubic Foot of Air* for the month was 541 grains, being 3 grains *greater* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 6·4.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·40. The maximum daily amount of *Sunshine* was 12·2 hours on May 1.

The highest reading of the *Solar Radiation Thermometer* was $142^{\circ}\cdot8$ on May 26; and the lowest reading of the *Terrestrial Radiation Thermometer* was $22^{\circ}\cdot8$ on May 1.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 1·6; for the 6 hours ending 3 p.m., 1·7; and for the 6 hours ending 9 p.m., 0·6.

The *Proportions of Wind* referred to the cardinal points were N. 12, E. 9, S. 4, and W. 5. One day was calm.

The *Greatest Pressure of the Wind* in the month was $10^{lbs}\cdot5$ on the square foot on May 27. The mean daily *Horizontal Movement of the Air* for the month was 281 miles; the greatest daily value was 528 miles on May 24; and the least daily value 94 miles on May 10.

Rain fell on 4 days in the month, amounting to $0^{in}\cdot497$, as measured in the simple cylinder gauge partly sunk below the ground; being $1^{in}\cdot571$ *less* than the average fall for the 39 years, 1841–1879.

MONTH and DAY, 1880.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Lowest.	Daily Range.	Mean of 24 Hourly Values.	Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays, shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass, shown by a Self-Registering Minimum Thermometer.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	hours.	hours.	in.		
June 1	..	29·536	63·3	47·0	18·3	52·0	− 5·5	49·3	46·5	5·5	17·5	0·2	82	126·6	38·[illegible]	1·7	16·2	0·089	3·0	wP : wN, wP
2	..	29·854	62·6	48·1	14·5	54·7	− 3·0	52·9	51·2	3·5	9·1	1·0	88	123·2	40·9	1·0	16·3	0·009	0·0	wP : vP
3	..	29·727	58·1	48·4	9·7	52·5	− 5·4	51·3	50·1	2·4	4·6	0·6	92	73·1	47·5	0·0	16·3	0·000	0·0	mP, wN : vP, wN
4	..	29·728	59·1	42·7	16·4	50·5	− 7·6	47·4	44·1	6·4	13·8	0·2	79	120·8	35·5	1·5	16·3	0·129	0·0	vP, wN : mP
5	..	29·822	61·5	37·5	24·0	50·4	− 7·8	46·1	41·6	8·8	18·0	1·5	73	112·5	30·5	7·1	16·4	0·018	0·0	mP, wN : vN, mP
6	..	29·719	63·3	50·0	13·3	55·0	− 3·3	51·6	48·3	6·7	16·7	0·8	79	102·0	46·0	0·5	16·4	0·180	1·0	wP, vN : mP
7	New Moon	29·553	66·8	48·1	18·7	54·5	− 3·9	51·1	47·8	6·7	17·1	1·1	78	128·0	43·0	6·1	16·4	0·068	4·8	mP : vP, vN
8	[illegible]	29·600	62·0	46·0	16·0	52·8	− 5·7	49·2	45·2	7·6	18·0	1·5	76	113·9	40·0	4·5	16·4	0·084	10·0	mP, mN : vN, mP
9	..	29·637	59·9	43·0	16·9	50·6	− 7·9	48·2	45·7	4·9	11·0	0·6	84	98·9	37·8	0·8	16·4	0·049	11·2	mP : mN, mP
10	..	29·666	66·2	41·0	25·2	53·8	− 4·8	50·2	46·7	7·1	16·[illegible]	0·0	76	141·5	33·0	7·8	16·5	0·000	9·0	sP : mP
11	..	29·718	65·3	47·2	18·1	54·8	− 3·9	51·8	48·9	5·9	15·6	0·0	80	110·5	41·0	2·9	16·5	0·000	0·0	mP : vP
12	..	29·823	68·8	45·2	23·6	56·4	− 2·4	52·0	47·9	8·5	16·6	0·4	73	120·8	38·9	7·6	16·5	0·000	0·0	vP : wN, mP
13	..	29·847	74·3	46·1	28·2	59·3	+ 0·4	53·7	48·7	10·6	21·6	0·4	68	134·6	40·1	9·6	16·5	0·000	0·3	sP : mP
14	..	29·879	72·2	50·0	22·2	58·7	− 0·4	55·7	53·0	5·7	15·8	1·1	82	123·0	42·9	0·2	16·5	0·145	0·7	mP, wN : vN, vP
15	[illegible]	29·878	56·2	52·5	3·7	54·1	− 5·2	52·6	51·1	3·0	5·[illegible]	0·4	90	66·3	50·1	0·0	16·5	0·275	2·0	mP : wP, wN
16	..	29·800	59·6	52·6	7·0	56·2	− 3·3	55·9	55·6	0·6	2·1	0·0	98	76·0	51·7	0·0	16·5	0·297	0·0	wP, wN : wP
17	..	29·949	66·9	51·5	15·4	59·5	− 0·2	58·1	56·9	2·6	5·9	0·0	92	113·0	45·5	1·6	16·6	0·012	0·0	wP, wN : vP
18	..	29·792	74·4	51·6	22·8	63·3	+ 3·4	58·8	55·0	8·3	19·7	1·0	75	137·8	43·0	13·[illegible]	16·6	0·020	7·8	mP : mP, vN
19	..	29·550	72·3	54·3	18·0	61·8	+ 1·6	58·1	55·0	6·8	16·7	0·8	79	137·2	49·0	6·5	16·6	0·135	7·3	vP, vN : sP
20	..	29·463	70·9	54·2	16·7	60·9	+ 0·4	58·2	55·9	5·0	13·3	0·4	84	128·8	49·4	3·5	16·6	0·141	11·0	vP, sN : mP
21	[illegible]	29·508	74·1	51·2	22·9	61·5	+ 0·7	56·5	52·2	9·3	17·8	1·0	72	142·6	45·0	11·7	16·6	0·000	11·0	mP : sP
22	[illegible]	29·575	63·1	54·3	8·8	58·1	− 3·0	56·4	54·9	3·2	7·4	0·6	89	84·5	48·2	0·0	16·6	0·192	0·0	vP, vN : vP, vN
23	..	29·587	72·0	53·1	18·9	59·4	− 2·0	56·8	54·5	4·9	12·8	0·2	85	139·3	48·7	4·1	16·6	0·036	3·0	vP : sN, vP
24	..	29·584	72·5	52·3	20·2	59·2	− 2·5	56·3	53·7	5·5	15·8	0·2	83	129·7	48·9	5·3	16·6	0·318	0·0	mP, sN : vP, vN
25	..	29·653	75·1	51·0	24·1	59·4	− 2·5	56·9	54·7	4·7	14·9	0·2	85	137·5	47·0	4·5	16·6	0·038	0·0	mP : sP, sN
26	..	29·735	70·4	51·0	19·4	58·[illegible]	− 3·4	56·6	54·8	3·8	11·9	0·4	87	127·2	45·3	0·4	16·5	0·222	5·0	sP, wN : vP, vN
27	In Equator	30·013	74·6	49·8	24·8	62·6	+ 0·6	58·0	54·1	8·5	17·1	0·2	74	134·3	45·6	7·9	16·5	0·000	0·3	sP : mP
28	..	30·035	76·1	56·8	19·3	65·1	+ 3·2	59·9	55·6	9·5	16·5	2·5	72	138·0	53·2	8·2	16·5	0·000	0·7	mP : vP
29	Last Qr.	29·874	80·0	55·8	24·2	65·6	+ 3·8	60·5	56·3	9·3	17·8	1·7	72	138·6	49·6	9·5	16·5	0·000	2·0	mP : vP
30	..	29·627	80·2	53·2	27·0	63·5	+ 1·8	58·4	54·1	9·4	22·3	1·2	72	138·0	46·0	5·1	16·5	0·000	2·8	sP : vP
Means	..	29·738	68·1	49·5	18·6	57·5	− 2·3	54·3	51·3	6·2	14·4	0·7	80·6	119·9	43·8	4·4	16·5	2·257	3·1	..
Number of Column for Reference	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The results apply to the civil day.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers.

The values given in Columns 3, 4, 5, 14, and 15 are derived from eye-readings of self-registering thermometers.

The mean reading of the Barometer for the month was 29in·738, being 0in·090 *lower* than the average for the 20 years, 1854-1873.

TEMPERATURE OF THE AIR.

The highest in the month was 80°·2 on June 30; the lowest in the month was 37°·5 on June 5; and the range was 42°·7.

The mean of all the highest daily readings in the month was 68°·1, being 3°·0 *lower* than the average for the 39 years, 1841-1879.

The mean of all the lowest daily readings in the month was 49°·5, being 0°·5 *lower* than the average for the 39 years, 1841-1879.

The mean of the daily range was 18°·6, being 2°·5 *less* than the average for the 39 years, 1841-1879.

The mean for the month was 57°·5, being 2°·3 *lower* than the average for the 20 years, 1849-1868.

MONTH and DAY. 1880.	WIND AS DEDUCED FROM SELF-REGISTERING ANEMOMETERS. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	CLOUDS AND WEATHER. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
June 1	NE	NE	6·4	0·0	0·3	362	p.-cl : 8, cu.-s, ci.-cu	10, shs.-r : 10, slt.-r
2	NE	NE : NNE	4·0	0·0	0·2	325	10 : 10, li.-shs	9, cu.-s, oc.-shs : 10, oc.-shs
3	N	N : NNW	1·4	0·0	0·1	264	10 : 10	10 : 10, li.-shs : 10, li.-shs
4	NNW : N	N : NNW	4·7	0·0	0·8	375	10, r : 10	9, ci.-cu, cu.-s : v, ci.-cu
5	NNW : WSW : NW	NW : W	2·7	0·0	0·3	336	p.-cl : 7, cu.-s, ci.-cu	9, cu.-s, ci.-cu : 10, shs.-r
6	WSW : W	WNW : WSW	5·2	0·0	0·5	395	10 : 10, r	10 : 10, th.-cl
7	SW	WSW : WNW	19·0	0·0	1·5	515	10 : 10, th.-r, w	7, cu.-s, ci.-cu, hy.-sh, w : 5, cu.-s, n
8	SW	SW : WSW	11·0	0·0	1·0	476	10 : 10	8, cu.-s, ci.-cu, ci, shs.-r : v, sh.-r
9	SW : S	SSW	0·0	0·0	0·0	185	v : 8, cu.-s, ci.-cu, th.-cl, shs.-r	10, fq.-r : 10
10	SW : SE	SE : E : ESE	0·0	0·0	0·0	118	10 : 9, cu.-s	7, cu.-s, ci.-cu : v, cu.-s, ci.-cu, li.-cl
11	E : NNE	NNE : N	0·5	0·0	0·0	234	p.-cl : 10	9, cu.-s, ci.-cu : 0
12	NNW : N	N : E : SW	0·0	0·0	0·0	139	p.-cl : 10	8, th.-cl, h : 2, ci.-s
13	WSW	SW : SSW : WSW	0·0	0·0	0·0	184	p.-cl : 5, cu.-s, ci.-cu	7, cu.-s, ci.-cu : 5, cu.-s, ci, ci.-cu
14	WSW : NNW	NNW : NNE : N	0·0	0·0	0·0	168	p.-cl : 10, slt.-f	10, shs.-r : 10, shs.-r
15	NNE : NNW	NNW : N	1·8	0·0	0·0	312	10 : 10	10, r : 10, r
16	N : NNE	ENE : E	0·5	0·0	0·0	228	10, r : 10, r	10, r : 10
17	NE : NNW : N	E : ENE	0·4	0·0	0·0	172	10 : 10, sh.-r	10 : 10, th.-cl
18	NE	ENE : E : ESE	1·6	0·0	0·0	257	p.-cl : 4, ci.-cu, ci	3, ci.-cu, ci.-s, ci : 8, cu.-s, ci.-cu, shs.-r
19	ENE : SE	S : E	0·0	0·0	0·0	155	10 : 10, r	6, cu.-s, ci.-cu : 3, ci.-s, ci.-cu
20	ENE : E : SE	S : SSW	0·6	0·0	0·0	227	p.-cl, r : 9, cu.-s, ci.-s, slt.-r	8, ci.-cu, cu.-s, ci.-s, sh.-r : 6, cu.-s, ci.-cu
21	SSW : S	S : SSE	0·5	0·0	0·0	200	p.-cl : 5, cu.-s	5, cu.-s, ci.-cu, cu : 1, ci.-s
22	NE : Calm	WSW	0·0	0·0	0·0	128	v : 10, r	10, r : 10, shs.-r
23	WSW	SW	0·5	0·0	0·0	198	10 : 8, cu.-s, ci.-cu	9, cu.-s, ci.-s, ci, hy.-sh : 7, cu.-s, ci.-cu, shs.-r, t
24	WSW	WSW : SW	2·4	0·0	0·1	230	p.-cl : 6, ci.-cu, cu, h, hy.-sh	7, cu.-s, cu, ci.-cu, shs.-r, so.-ha : 10, r, l
25	WSW	WSW : SW	0·0	0·0	0·0	178	p.-cl : 6, cu.-s, ci.-cu	7, cu.-s, ci.-cu, cu : 10, r, t, glm
26	SW : NE	ENE : SW	0·0	0·0	0·0	108	10 : 10, m, glm	10, cu.-s, ci.-cu, slt.-r, t : 10, shs.-r
27	NW : WSW	WSW : SW	0·8	0·0	0·0	248	p.-cl : 3, ci.-cu, ci, ci.-s	9, cu.-s, ci.-cu : 9, ci.-s
28	SW : WSW	WSW : W	3·6	0·0	0·5	393	10 : 9, ci.-cu, cu.-s	4, ci, ci.-cu, cu.-s, ci.-s : 2, ci, ci.-cu
29	WSW	SW : SSW	1·2	0·0	0·0	261	p.-cl : 5, ci.-cu, ci	1, ci.-cu, ci, li.-cl : 2, ci.-s
30	SW : WSW	SW : SSW	0·0	0·0	0·0	205	p.-cl : 8, ci.-cu, h, so.-ha	6, ci.-s, ci.-cu, cu.-s, ci : 10
Means	...	...	..	..	0·2	252		
Number of Column for Reference.	21	22	23	24	25	26	27	28

The mean *Temperature of Evaporation* for the month was 54°·3, being 0°·9 *lower* than
The mean *Temperature of the Dew Point* for the month was 51°·3, being 0°·1 *higher* than
The mean *Degree of Humidity* for the month was 80·6, being 7·3 *greater* than
The mean *Elastic Force of Vapour* for the month was 0in·378, being 0in·001 *greater* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 4grs·2, being *the same as*
The mean *Weight of a Cubic Foot of Air* for the month was 532 grains, being 1 grain *greater* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 7·8.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·27. The maximum daily amount of *Sunshine* was 13·0 hours on June 18.

The highest reading of the *Solar Radiation Thermometer* was 142°·6 on June 21; and the lowest reading of the *Terrestrial Radiation Thermometer* was 30°·5 on June 5.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 1·3; for the 6 hours ending 3 p.m., 1·0; and for the 6 hours ending 9 p.m., 0·8.

The *Proportions of Wind* referred to the cardinal points were N. 8, E. 5, S. 8, and W. 9.

The *Greatest Pressure of the Wind* in the month was 19lbs·0 on the square foot on June 7. The mean daily *Horizontal Movement of the Air* for the month was 252 miles; the greatest daily value was 515 miles on June 7; and the least daily value 108 miles on June 26.

Rain fell on 20 days in the month, amounting to 2in·257, as measured in the simple cylinder gauge partly sunk below the ground; being 0in·212 *greater* than the average fall for the 39 years, 1841–1879.

MONTH and DAY, 1880.	Phases of the Moon.	Barometer. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	Temperature. Of the Air. Highest.	Lowest.	Daily Range.	Mean of 24 Hourly Values.	Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	Temperature. Highest in the Sun's Rays.	Lowest on the Grass.	[illegible]	[illegible]	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°			in.		
July 1	..	29·536	71·7	54·2	17·5	61·1	− 0·5	58·8	56·8	4·3	10·3	1·3	8[illegible]	131·9	47·7	1·2	15·5	0·488	3·0	mP : vP, mN
2	..	29·620	69·1	49·1	20·0	58·3	− 3·2	55·6	53·2	5·1	12·6	0·6	83	121·3	44·[illegible]	3·5	16·5	0·196	13·5	mP, wN : mP
3	..	29·541	70·0	54·4	15·6	59·2	− 2·2	56·9	54·9	4·3	12·6	0·4	85	132·8	51·5	7·1	15·4	0·316	12·8	mP : mP, vN
4	..	29·738	66·4	54·0	12·4	58·1	− 3·3	55·2	52·6	5·5	11·2	0·2	82	118·0	51·1	2·5	15·4	0·053	3·0	wP : vP
5	Greatest Declination S.	29·778	72·9	48·0	24·9	60·8	− 0·7	55·2	50·3	10·5	19·4	1·3	68	130·1	41·8	[illegible]	16·4	[illegible]	0·0	vP : vN, mP
6	..	29·866	67·4	52·2	15·2	59·3	− 2·4	56·5	54·0	5·3	11·9	1·2	83	127·3	46·8	0·3	16·4	0·015	1·8	vP : vP, wN
7	New	29·555	65·0	53·0	12·0	58·2	− 3·7	56·3	54·6	3·6	8·1	1·5	88	94·8	47·0	0·0	16·3	0·014	8·0	mP : vP, wN
8	..	29·488	69·4	51·0	18·4	58·4	− 3·8	54·8	51·6	6·8	16·4	1·0	78	136·6	45·5	0·6	16·3	0·122	4·0	mP, wN : vN, mP
9	..	29·605	69·3	52·1	17·2	59·0	− 3·5	55·1	51·6	7·4	16·2	0·6	77	138·0	46·9	11·1	16·3	0·23[illegible]	14·8	mP, wN : mP
10	..	29·716	71·6	50·5	21·1	59·0	− 3·7	55·6	52·5	6·5	14·4	0·4	80	144·3	44·2	9·[illegible]	16·3	0·018	1·5	vP : sN, sP
11	..	29·923	74·3	51·5	22·8	59·9	− 3·0	57·2	54·9	5·0	13·5	0·6	84	141·0	47·6	3·6	16·2	0·188	0·0	mP, mN : vP, vN
12	In Equator	29·988	73·1	54·5	18·6	61·1	− 2·0	56·5	52·5	8·6	15·1	1·1	74	136·0	[illegible]	4·2	16·2	0·000	2·2	mP : vP
13	..	29·968	73·4	53·9	19·5	61·2	− 2·1	57·4	54·1	7·1	16·4	1·4	78	134·0	49·4	5·7	16·2	0·003	7·8	mP : mP, wN
14	..	29·888	77·2	54·0	23·2	62·7	− 0·7	59·8	57·4	5·3	16·5	0·[illegible]	83	145·6	47·0	4·1	16·1	0·05[illegible]	8·0	mP, vN : mP
15	First Qr.	29·791	75·4	58·2	17·2	65·1	+ 1·7	62·7	60·8	4·3	10·9	0·[illegible]	86	112·0	53·8	3·9	16·1	0·030	0·0	mP, vN : wN, mP
16	..	29·882	77·1	55·3	21·8	65·2	+ 1·7	62·1	59·5	5·7	11·7	0·0	82	130·2	48·6	1·2	16·1	0·013	0·0	vP, mN : mP
17	..	29·835	75·9	57·6	18·3	64·9	+ 1·4	62·9	61·3	3·6	12·2	0·[illegible]	88	128·8	53·5	3·5	16·7	0·040	2·3	vP : mP, sN
18	..	29·786	71·2	56·0	15·2	63·8	+ 0·4	60·0	56·9	6·[illegible]	15·7	0·4	78	137·3	50·[illegible]	7·5	16·7	0·013	13·5	mP : vP
19	Greatest Declination N.	29·838	74·4	55·6	18·8	63·9	+ 0·6	59·8	55·4	7·5	16·9	0·8	77	132·5	50·3	5·[illegible]	15·[illegible]	0·031	11·2	wP : mP
20	Perigee	29·915	76·2	54·2	22·0	64·0	+ 0·8	59·1	55·0	9·0	22·1	0·8	73	137·1	46·1	8·8	15·9	0·000	0·5	mP : wN, mP
21	Full	29·887	76·1	53·2	22·9	62·6	− 0·4	59·9	57·6	5·0	13·7	0·2	84	132·0	45·[illegible]	3·0	15·[illegible]	0·21[illegible]	1·5	mP : vP, vN
22	..	29·820	72·1	55·5	16·6	61·6	− 1·3	58·8	56·4	5·2	18·4	0·2	84	140·1	47·6	4·0	15·8	0·073	1·3	wP, mN : mP
23	..	29·819	77·9	54·6	23·3	64·1	+ 1·3	59·3	55·3	8·8	25·1	0·2	73	137·3	47·4	[illegible]	15·8	0·000	9·5	mP : mP
24	..	29·731	76·3	55·3	21·0	63·5	+ 0·8	59·5	56·2	7·3	15·6	0·4	77	141·0	50·0	4·0	15·7	0·018	9·5	mP, wN : vP
25	In Equator	29·725	70·1	51·5	27·6	64·7	+ 2·0	59·1	54·4	10·3	19·5	0·8	70	144·6	46·[illegible]	11·4	15·7	0·010	6·0	mP : mP
26	..	29·409	73·8	56·2	17·6	62·6	− 0·1	61·0	59·6	3·0	13·0	0·[illegible]	90	129·2	50·1	2·5	15·7	0·404	20·5	vP, wN : mP
27	..	29·592	75·1	58·0	17·1	65·1	+ 2·5	60·0	55·8	9·3	20·6	0·[illegible]	72	132·1	50·1	10·3	15·[illegible]	0·020	3·8	mP : wN, vP
28	Last Qr.	29·581	70·9	59·6	11·3	63·6	+ 1·0	60·2	57·4	6·2	13·0	2·7	80	122·8	56·8	2·3	15·6	0·063	9·2	mP : mP
29	..	29·422	74·3	54·9	19·4	63·3	+ 0·7	60·0	57·3	6·0	14·9	0·8	80	141·1	50·0	6·3	15·5	0·275	10·2	wP : mP
30	..	29·4[illegible]	72·6	51·2	21·4	57·9	− 4·7	55·5	53·3	4·6	15·3	0·6	84	14[illegible]·2	46·1	4·5	15·5	0·[illegible]80	3·0	mP, sN : vP, mN
31	..	29·599	69·9	47·5	22·4	57·6	− 5·0	53·5	49·7	7·9	17·5	0·6	75	132·5	42·9	9·8	15·4	0·001	1·5	mP : vP, wN
Means	..	29·727	72·[illegible]	53·8	1[illegible]·[illegible]	61·6	− 1·0	58·2	55·3	6·3	15·0	0·7	80·1	132·[illegible]	48·6	5·5	16·0	Sum 3·812	5·9	....
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The results apply to the civil day.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers.

The values given in Columns 3, 4, 5, 14 and 15 are derived from eye-readings of self-registering thermometers.

The mean reading of the Barometer for the month was 29in·727, being 0in·082 lower than the average for the [illegible] years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 7[illegible] on July 25; the lowest in the month was 47°·5 on July 31; and the range was 31°·6.

The mean of all the highest daily readings in the month was 72°·[illegible], being 1°·3 lower than the average for the 39 years, 1841–1879.

The mean of all the lowest daily readings in the month was 53°·8, being 0°·7 higher than the average for the 39 years, 1841–1879.

The mean daily range was 19°·1, being 2°·0 less than the average for the 39 years, 1841–1879.

The mean for the month was 61°·6, being 1°·0 lower than the average for the 20 years, 1849–1868.

MONTH and DAY, 1880.	WIND AS DEDUCED FROM SELF-REGISTERING ANEMOMETERS. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	CLOUDS AND WEATHER. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
July 1	SW	WSW : W	1·3	0·0	0·0	243	10 : 10, shs.-r	10,cu.-s,ci.-cu,hy.-shs,t.-sm : 7, cu.-s, n
2	WSW : SW	SW : SSW	5·4	0·0	0·4	350	p.-cl : 7, ci.-cu, cu.-s, cu, ci.-s	9,n,cu.-s,ci.-cu,hl,hy.-shs : 7,cu.-s,ci.-cu,shs.-r
3	SSW	SSW : SW	5·2	0·0	0·3	327	v, shs.-r : 8,cu.-s,ci.-cu,ci,hy.-shs	7,ci,ci.-cu,cu,cu.-s,shs.-r : 10, r, t
4	W : WNW : NNW	NNW	5·7	0·0	0·5	349	10 : 10	9, cu.-s, slt.-r : 7, cu.-s, ci.-cu
5	WSW : WNW : W	W : NNW	1·5	0·0	0·1	269	p.-cl : 1, ci.-s, h	3, ci.-s, cu, h : 8, ci.-cu, cu.-s
6	WSW : SW	SW : SSW	2·4	0·0	0·1	314	10 : 10, cu.-s, ci.-s	10, cu, ci.-cu, cu.-s : 10, slt.-r
7	SW	SSW : SW	2·1	0·0	0·1	321	10 : 10, shs.-r	10, shs.-r : 5, cu.-s, shs.-r
8	WSW : SW	SSW	4·6	0·0	0·2	350	p.-cl : 7, cu.-s, ci.-cu	6,cu,cu.-s,ci.-cu,ci.-s,n,t,shs.-r : 8,cu.-s,ci.-cu,shs.-r
9	SSW	SSW	3·1	0·0	0·4	311	p.-cl : 5,cu.-s,ci.-cu,cu,ci.-s,shs.-r	7, cu,cu.-s,ci.-cu,ci.-s,ci : 4, cu.-s, ci.-s, s
10	SSW : WSW	SW : WSW	3·2	0·0	0·0	241	p.-cl : 3, cu, cu.-s	7, cu.-s,cu,ci.-cu,t,shs.-r : 2, cu.-s, ci
11	SW	SW	1·0	0·0	0·0	206	p.-cl : 8, cu.-s,ci.-cu, ci,li.-shs	7, cu.-s, ci.-cu, ci, shs.-r : 4, cu.-s, ci.-cu
12	WSW	SW	0·3	0·0	0·0	219	p.-cl : 10	9, cu.-s, cu : 4, ci.-s
13	SSW	SSW : S	1·6	0·0	0·0	231	v : 10, cu.-s	9,cu.-s,cu,ci : v, sh.-r : 2, ci.-cu, ci
14	Calm : SE	SSE : ENE : NE	0·3	0·0	0·0	147	p.-cl, l : r : 4, ci.-cu, ci	9, cu.-s, cu, slt.-r, t : 10, l
15	NE : ENE : N	NNW : N : SW	0·6	0·0	0·0	137	10 : 10, r, t, m	9, cu.-s, ci.-cu, m : v, ci.-s, l
16	SW : NE : N	NNE : NE	0·0	0·0	0·0	131	p.-cl : 6, ci.-cu, th.-cl, sh.-r	9, cu.-s, ci.-cu : 4, ci, l, t
17	N : NE	NE : SE : SW	0·6	0·0	0·0	123	v : 10	8, cu, ci.-cu, ci, h : 7, cu.-s, l, hy.-sh
18	S : SW	WSW : SW	3·5	0·0	0·4	318	p.-cl : 7, cu, ci.-cu, ci	8,cu,ci.-cu,ci,shs.-r,t : 7, cu.-s, ci.-cu
19	SW : WSW	SW	3·3	0·0	0·3	334	10, r : 10, cu, cu.-s	7, cu, cu.-s, ci, ci.-cu : 7, cu.-s, ci.-cu, sh.-r
20	SW	NNW : N : E	3·7	0·0	0·0	219	p.-cl : 7, cu, cu.-s, ci	6, cu, ci, cu.-s, slt.-h : 5, cu.-s, ci.-cu
21	ESE : S	SE : ENE	0·2	0·0	0·0	127	p.-cl : 6, cu.-s, ci.-cu, cu, ci, slt.-sh	8, cu, cu.-s, fq.-r, t : 3, ci.-s, t, l
22	E	ENE : ESE	0·0	0·0	0·0	107	v : 10, r	7, ci.-cu, cu, ci : 2, ci, d
23	S : SW	S : SSW	0·9	0·0	0·0	177	p.-cl : 3, ci.-cu, ci	7, ci.-cu, cu.-s, ci.-s : 9, th.-cl, lu.-ha
24	SSW : SW	SSW : SW	1·5	0·0	1·0	219	10, r : 10, th.-cl, cu, slt.-r	7, cu.-s, ci.-cu, ci.-s : 1, ci.-s
25	WSW : SW	SW : SSW : S	1·0	0·0	0·0	197	p.-cl : 5, cu, ci.-s	6, cu.-s, ci.-cu, ci.-s : 9, r
26	SE : SSE : S	SSW : SW : WSW	3·0	0·0	0·2	267	10, hy.-r : 10, shs.-r : 10, r	8, cu, cu.-s, ci, r : 10, fq.-r
27	WSW	W : SW	4·9	0·0	1·0	440	10, r : 7, cu, cu.-s, ci	5, ci, ci.-s, cu, cu.-s : 10, slt.-r
28	SSW : SW	SSW	4·3	0·0	0·8	377	10 : 10, slt.-r	10, oc.-slt.-r : 10, r
29	SSW	SW : W : WSW	6·1	0·0	0·9	381	10, r : 10, r	5,cu,cu.-s,ci,ci.-s,r,t : 1, cu.-s
30	SSW : S : W	WSW : SW	9·5	0·0	0·2	284	v, r : 10, hy.-r	5,cu,cu.-s,ci.-cu,hy.-sh,hl,l,t : 10, cu.-s, th.-r, l
31	WSW : W	WSW : SSW	1·8	0·0	0·0	273	p.-cl : 2, slt.-h	v, cu.-s, ci.-cu, slt.-r : 9, cu.-s
Means	...	...	..	..	0·2	258		
Number of Column for Reference	21	22	23	24	25	26	27	28

The mean *Temperature of Evaporation* for the month was 58°·2, being 0°·5 *higher* than
The mean *Temperature of the Dew Point* for the month was 55°·3, being 1°·6 *higher* than
The mean *Degree of Humidity* for the month was 80·1, being 7·1 *greater* than
The mean *Elastic Force of Vapour* for the month was 0in·437, being 0in·024 *greater* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 4grs·8, being 0gr·2 *greater* than
The mean *Weight of a Cubic Foot of Air* for the month was 527 grains, being 1 grain *less* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 7·2.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·34. The maximum daily amount of *Sunshine* was 11·4 hours on July 25.

The highest reading of the *Solar Radiation Thermometer* was 145°·6 on July 14; and the lowest reading of the *Terrestrial Radiation Thermometer* was 41°·8 on July 5.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 3·3; for the 6 hours ending 3 p.m., 1·7; and for the 6 hours ending 9 p.m., 0·9.

The *Proportions of Wind* referred to the cardinal points were N. 2, E. 3, S. 14, and W. 12.

The *Greatest Pressure of the Wind* in the month was 9lbs·5 on the square foot on July 30. The mean daily *Horizontal Movement of the Air* for the month was 258 miles; the greatest daily value was 440 miles on July 27; and the least daily value 107 miles on July 22.

Rain fell on 24 days in the month, amounting to 3in·812, as measured in the simple cylinder gauge partly sunk below the ground; being 1in·409 *greater* than the average fall for the 39 years, 1841–1879.

MONTH and DAY, 1880.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	TEMPERATURE. Of the Air. Lowest.	TEMPERATURE. Of the Air. Daily Range.	TEMPERATURE. Of the Air. Mean of 24 Hourly Values.	TEMPERATURE. Of the Air. Excess of Mean above Average of 20 Years.	TEMPERATURE. Of Evaporation. Mean of 24 Hourly Values.	TEMPERATURE. Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Greatest of 24 Hourly Values.	Difference between the Air Temperature and Dew Point Temperature. Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	TEMPERATURE. Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	hours.	hours.	in.		
Aug. 1	Greatest Dec. N. Apogee.	29·477	66·3	50·5	15·8	57·1	− 5·5	55·0	53·1	4·0	11·4	0·6	86	110·1	49·1	0·1	15·3	0·216	4·5	mP, wN : vP
2	..	29·519	66·4	49·8	16·6	56·8	− 5·9	55·3	53·9	2·9	10·3	0·2	90	122·1	42·8	1·7	15·3	0·318	0·0	mP, wN : vN, wP
3	..	29·716	70·9	46·4	24·5	59·6	− 3·1	55·7	52·3	7·3	16·2	0·0	77	127·7	39·0	5·5	15·2	0·000	0·0	vP : vP, wN
4	..	29·749	74·2	56·0	18·2	63·7	+ 1·0	60·8	58·5	5·2	11·3	0·4	83	134·3	47·6	3·2	15·2	0·000	0·0	wP : vP
5	..	29·664	77·2	56·7	20·5	65·0	+ 2·3	61·3	58·2	6·8	15·1	0·4	80	136·0	47·8	3·0	15·1	0·000	3·0	mP : mP
6	New	29·479	72·1	57·3	14·8	63·2	+ 0·5	60·7	58·6	4·6	12·1	0·9	85	99·2	50·1	0·1	15·1	0·001	0·0	mP : mP, wN
7	..	29·316	68·7	50·3	18·4	58·0	− 4·7	55·9	54·0	4·0	11·2	0·2	86	120·0	45·3	1·7	15·0	0·182	1·2	mP : mP, mN
8	In Equator	29·454	66·2	53·2	13·0	59·1	− 3·6	55·6	52·5	6·6	14·0	1·6	79	124·2	49·6	2·9	15·0	0·145	3·8	mP : mN, wP
9	..	29·862	75·6	50·1	25·5	61·3	− 1·4	57·1	53·5	7·8	20·1	0·0	76	135·0	42·8	9·0	14·9	0·000	0·0	mP, wN : vN, vP
10	..	30·099	78·4	51·8	26·6	65·3	+ 2·6	60·2	56·0	9·3	18·4	0·8	72	132·2	43·4	11·1	14·9	0·000	0·0	mP : wN, mP
11	..	30·067	79·2	55·5	23·7	65·9	+ 3·2	61·6	58·1	7·8	16·2	0·4	76	144·9	41·7	6·4	14·8	0·000	1·0	vP : mP
12	..	30·015	75·1	56·0	19·1	64·7	+ 2·1	60·8	57·6	7·1	14·8	1·1	78	131·4	45·5	5·3	14·7	0·000	0·0	vP : sP
13	First Qr.	29·942	78·1	58·8	19·3	65·6	+ 3·1	62·3	59·6	6·0	15·0	2·0	81	132·0	55·1	4·4	14·7	0·000	0·0	mP : vP
14	..	29·922	74·3	59·0	15·3	63·4	+ 1·0	61·3	59·5	3·9	10·3	0·2	88	130·2	58·6	0·7	14·6	0·000	0·0	vP : vP, wN
15	Greatest Declination S.	29·926	71·3	58·8	12·5	62·4	+ 0·1	60·9	59·6	2·8	7·4	0·2	91	123·8	58·8	0·6	14·6	0·000	0·0	vP : vP, wN
16	..	29·908	67·6	57·4	10·2	61·3	− 0·8	59·6	58·1	3·2	6·7	1·1	90	99·5	57·2	0·0	14·5	0·000	0·0	vP : vP
17	Perigee	29·933	77·4	59·0	18·4	64·8	+ 2·9	61·6	58·9	5·9	15·5	0·8	82	128·3	56·8	5·6	14·4	0·000	0·0	vP : vP
18	..	29·953	69·6	58·0	11·6	62·2	+ 0·4	58·8	55·9	6·3	11·0	1·7	80	104·0	57·2	0·3	14·4	0·000	0·0	vP, wN : vP
19	..	29·871	78·0	57·5	20·5	64·2	+ 2·6	60·9	58·2	6·0	14·1	0·2	81	132·0	57·4	3·3	14·3	0·000	0·0	vP : vP
20	Full	29·874	73·6	61·0	12·6	64·4	+ 3·0	62·3	60·6	3·8	9·0	1·1	88	112·5	60·3	2·4	14·3	0·000	0·0	vP, wN : vP
21	In Equator	29·920	78·0	59·0	19·0	65·0	+ 3·7	61·0	57·7	7·3	18·2	1·3	78	129·2	53·4	6·4	14·2	0·000	2·0	mP : vP
22	..	29·892	74·0	54·0	20·0	62·7	+ 1·4	58·1	54·2	8·3	17·6	2·8	74	131·4	46·0	4·7	14·1	0·000	0·0	mP : vP
23	..	29·872	68·0	53·2	14·8	59·4	− 1·8	57·0	54·9	4·5	10·1	0·2	86	89·5	44·4	0·0	14·1	0·000	0·0	vP, wN : vP
24	..	29·865	69·9	53·6	16·3	60·7	− 0·4	58·0	55·6	5·1	11·2	0·4	84	103·3	48·0	0·3	14·0	0·000	0·0	mP : vP
25	..	29·823	64·8	55·8	9·0	60·8	− 0·2	59·8	59·0	1·8	4·3	0·4	94	77·6	49·2	0·0	13·9	0·100	0·0	vP, vN : vP
26	..	29·751	74·9	59·9	15·0	65·6	+ 4·7	63·7	62·2	3·4	10·7	0·0	89	100·5	58·3	2·3	13·9	0·000	0·0	vP, mN : sN, mP
27	Last Qr.	29·933	67·8	59·9	7·9	63·0	+ 2·2	61·8	60·8	2·2	5·6	0·0	93	94·6	55·0	0·0	13·8	0·000	0·0	mP : vP
28	Greatest Declination N.	30·014	80·9	60·0	20·9	67·4	+ 6·7	63·3	60·1	7·3	22·1	0·2	77	129·1	55·0	7·5	13·8	0·000	0·0	wP : vP
29	Apogee	29·873	76·1	57·3	18·8	64·8	+ 4·2	60·9	57·7	7·1	17·3	1·0	78	135·8	51·2	7·0	13·7	0·015	3·0	mP : mP, sN
30	..	29·786	70·6	58·3	12·3	63·8	+ 3·4	60·3	57·4	6·4	15·7	0·6	80	115·7	52·8	2·4	13·7	0·000	4·0	mP : vP, wN
31	..	29·873	76·1	56·9	19·2	65·4	+ 5·1	61·9	59·0	6·4	13·9	0·6	81	112·2	49·5	7·8	13·6	0·001	0·0	mP, wN : wN, sP
Means	..	29·817	72·9	55·8	17·1	62·8	+ 0·9	59·8	57·3	5·5	13·1	0·7	82·7	119·3	50·6	3·4	14·5	Sum 0·978	0·7	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The results apply to the civil day.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers.

The values given in Columns 3, 4, 5, 14, and 15 are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was 29in·817, being 0in·018 *higher* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 80°·9 on August 28; the lowest in the month was 46°·4 on August 3; and the range was 34°·5.
The mean of all the highest daily readings in the month was 72°·9, being 0°·1 *lower* than the average for the 39 years, 1841–1879.
The mean of all the lowest daily readings in the month was 55°·8, being 2°·6 *higher* than the average for the 39 years, 1841–1879.
The mean daily range was 17°·1, being 2°·7 *less* than the average for the 39 years, 1841–1879.
The mean for the month was 62°·8, being 0°·9 *higher* than the average for the 20 years, 1849–1868.

MONTH and DAY. 1880.	WIND AS DEDUCED FROM SELF-REGISTERING ANEMOMETERS. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	CLOUDS AND WEATHER. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
Aug. 1	S : NE : E	NE : NW : SW	0·0	0·0	0·0	116	10 : 10, r : 10, r	10 : 4, ci.-cu
2	SW : W	WSW : N : NNW	3·6	0·0	0·0	170	p.-cl : 7, cu.-s, r	9, cu.-s, cu, ci.-cu, shs.-r : 7, ci.-cu, li.-shs
3	WSW : SW : NW	WNW : W : WSW	0·8	0·0	0·0	186	p.-cl : 6, cu.-s, h	8, cu, cu.-s, ci, h : 7, cu, ci, cu.-s
4	WSW : SW	SSW	0·6	0·0	0·0	163	10 : 10	10 : 1, s
5	SSW	SSW : S	0·6	0·0	0·0	201	p.-cl : 7, cu, cu.-s, ci, h	6, cu, cu.-s, ci.-cu, ci.-s : 4, ci, ci.-s
6	Calm : SW	SW : WSW	1·3	0·0	0·0	155	v : 10	10, slt.-r : p.-cl : 3, s
7	WSW : SW	SSW : S : SW : W	9·0	0·0	1·0	365	p.-cl : 9, cu.-s, ci, cu	10, shs.-r : 10, r
8	WNW	W : WSW	9·5	0·0	1·3	497	10 : 10, slt.-sh	5, cu.-s, ci, cu, shs.-r : 5, ci.-cu
9	WSW : W	NW : W : SW	0·0	0·0	0·0	189	0 : 0, h	6, cu, ci.-cu, cu.-s, ci : 0
10	SW : WSW	W : NNW : E	0·0	0·0	0·0	168	0 : 1, ci, h	1, ci, ci.-cu, h : 0
11	E : NE	NE : E	0·3	0·0	0·0	155	0 : v	7, cu.-s, ci.-cu, cu, ci : 10
12	NE : NNE	NNE	1·5	0·0	0·1	280	10 : 9, cu.-s, ci.-cu	7, cu.-s, cu, ci : v, ci.-s
13	NNE : N	N : NNE	2·0	0·0	0·1	292	10 : 10	6, cu.-s, cu, ci : 7, cu.-s, ci.-cu : 10
14	NNE	NNE	1·5	0·0	0·1	310	10 : 10	9, cu, ci.-cu, cu.-s : 10, th.-r
15	NNE	N : NNE	0·8	0·0	0·0	268	10 : 10	10 : 10
16	NNE	NE : NNE	0·3	0·0	0·0	280	10 : 10	10 : 10
17	NE	ENE : NE	5·0	0·0	0·5	337	10 : 10	6, cu, ci.-cu, cu.-s : 10
18	NE	ENE : NE	2·2	0·0	0·0	293	10 : 10	9, cu.-s : 10
19	NE	NE : ENE : NNE	0·6	0·0	0·0	240	10 : 10, m.-r	6, cu.-s, ci.-cu, cu : 10
20	NNE	N : NE	0·6	0·0	0·0	224	10 : 10	7, cu.-s, cu, ci.-cu : 3, ci.-cu
21	NE : NNE	ENE : NE	2·9	0·0	0·2	293	p.-cl : 10	3, cu.-s, cu, ci.-cu : v
22	NNE : NE	ENE	3·0	0·0	0·3	304	p.-cl : 8, cu.-s, ci.-cu	8, cu.-s, ci.-cu, ci : 1, ci.-s
23	ENE : NE	ENE : E : NE	1·7	0·0	0·0	262	v : 10	10 : v, cu.-s, ci.-cu
24	NE	ENE : E	0·0	0·0	0·0	248	10 : 10	10 : p.-cl : 2, i
25	NE : ENE	ENE : NE	0·9	0·0	0·1	238	v : 10, th.-r	10, th.-r : 10, l
26	NE : N : ENE	NE : SE : Calm	0·0	0·0	0·0	95	10 : 10	8, cu.-s, ci.-cu, ci, t : 9, cu.-s, ci.-cu, l
27	Calm : NE : N	N : NNE	0·6	0·0	0·0	150	10 : 10	10 : 10
28	N : NNE	ENE : E : NNE	1·8	0·0	0·1	226	10 : v	2, ci.-cu, cu.-s : 1, ci.-cu
29	NNE : NE	ENE : NE	1·0	0·0	0·1	241	p.-cl : 6, cu.-s, ci.-cu	7, cu.-s, ci.-cu, ci : v, sh.-r, l
30	N : NE	ENE : NE : N	0·3	0·0	0·0	169	p.-cl : 5, ci, ci.-cu, ci.-s	10 : 10, sh.-r
31	NNW : N	NNE : NW : WSW	0·0	0·0	0·0	144	10 : 10, m	0, h : 0
Means	...	...	..	..	0·1	235		
Number of Column for Reference.	21	22	23	24	25	26	27	28

The mean *Temperature of Evaporation* for the month was 59°·8, being 1°·9 *higher* than the average for the 20 years, 1849–1868.
The mean *Temperature of the Dew Point* for the month was 57°·3, being 2°·9 *higher* than the average for the 20 years, 1849–1868.
The mean *Degree of Humidity* for the month was 82·7, being 6·2 *greater* than the average for the 20 years, 1849–1868.
The mean *Elastic Force of Vapour* for the month was 0in·470, being 0in·046 *greater* than the average for the 20 years, 1849–1868.
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 5grs·2, being 0grs·5 *greater* than the average for the 20 years, 1849–1868.
The mean *Weight of a Cubic Foot of Air* for the month was 527 grains, being 1 grain *less* than the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 7·3.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·23. The maximum daily amount of *Sunshine* was 11·1 hours on August 10.

The highest reading of the *Solar Radiation Thermometer* was 144°·9 on August 11; and the lowest reading of the *Terrestrial Radiation Thermometer* was 39°·0 on August 3.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 0·4; for the 6 hours ending 3 p.m., 0·3; and for the 6 hours ending 9 p.m., 0·0.

The *Proportions of Wind* referred to the cardinal points were N. 13, E. 9, S. 3, and W. 5. One day was calm.

The *Greatest Pressure of the Wind* in the month was 9lbs·5 on the square foot on August 8. The mean daily *Horizontal Movement of the Air* for the month was 235 miles; the greatest daily value was 497 miles on August 8; and the least daily value 95 miles on August 26.

Rain fell on 6 days in the month, amounting to 0in·978, as measured in the simple cylinder gauge partly sunk below the ground; being 1in·515 *less* than the average fall for the 39 years, 1841–1879.

MONTH and DAY, 1880.	Phases of the Moon.	Barometer. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	Temperature. Of the Air. Highest.	Temperature. Of the Air. Lowest.	Temperature. Of the Air. Daily Range.	Temperature. Of the Air. Mean of 24 Hourly Values.	Temperature. Of the Air. Excess of Mean above Average of 20 Years.	Temperature. Of Evaporation. Mean of 24 Hourly Values.	Temperature. Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Difference. Greatest of 24 Hourly Values.	Difference. Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	Temperature. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Temperature. Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in	°	°	°	°	°	°	°	°	°	°		°	°	hours	hours	in.		
Sept. 1	..	30·069	77·0	53·6	23·4	64·3	+ 4·2	61·2	58·6	5·7	15·3	0·0	82	125·6	46·6	10·1	13·5	0·000	3·0	vP : sP
2	..	30·159	82·5	58·5	24·0	68·0	+ 8·0	63·8	60·5	7·5	17·3	0·4	77	135·2	52·9	8·3	13·4	0·000	0·0	mP : vP
3	..	30·068	85·0	56·7	28·3	69·0	+ 9·2	62·6	57·6	11·4	28·6	0·2	66	135·1	50·9	10·9	13·4	0·000	4·0	sP : sP
4	New	29·857	87·2	57·9	29·3	71·2	+11·5	65·3	60·8	10·4	24·0	0·0	69	143·2	48·3	9·0	13·3	0·000	8·8	sP : vP
5	In Equator	29·896	79·6	63·4	16·2	68·0	+ 8·5	63·9	60·6	7·4	17·9	2·7	78	134·6	57·5	6·7	13·2	0·000	7·0	mP : vP
6	..	29·932	76·0	52·6	23·4	63·0	+ 3·7	59·2	56·0	7·0	19·3	0·4	78	131·3	44·9	4·2	13·2	0·080	8·2	sP : vP
7	..	29·853	70·3	54·5	15·8	61·1	+ 2·1	56·6	52·7	8·4	17·8	0·2	75	115·3	48·0	6·6	13·1	0·069	0·0	vP : mN, mP
8	..	29·847	67·1	47·9	19·2	58·2	− 0·6	55·2	52·5	5·7	13·9	0·4	81	102·9	37·2	1·5	13·0	0·000	4·0	vP : mP
9	..	29·696	67·9	55·9	12·0	60·1	+ 1·6	58·1	56·3	3·8	9·9	0·0	88	125·7	51·6	0·3	13·0	0·007	1·5	mP : vP
10	..	29·589	79·5	53·9	25·6	64·3	+ 6·0	60·8	57·9	6·4	20·7	0·0	80	140·7	45·7	6·6	12·9	0·000	9·2	sP : mP
11	Greatest Dec. S First Quarter	29·498	74·2	54·8	19·4	62·7	+ 4·6	60·9	59·4	3·3	11·5	0·0	89	120·6	54·0	0·8	12·9	1·354	5·2	mP : vP, vN
12	..	29·482	69·9	51·7	18·2	59·5	+ 1·5	56·7	54·2	5·3	13·5	0·0	84	123·5	47·4	6·3	12·8	0·202	1·3	sN, mP : mP
13	Perigee	29·521	66·1	48·6	17·5	56·9	− 0·9	54·6	52·5	4·4	12·4	0·0	85	122·0	42·0	4·9	12·7	0·506	3·7	vN, mP : sN, vP
14	..	29·386	60·6	48·0	12·6	54·8	− 2·8	53·4	52·0	2·8	[illegible]	0·0	90	96·0	41·3	1·0	12·7	0·913	0·3	mP, wN : sN, vP
15	..	29·099	62·1	51·5	10·6	55·1	− 2·3	54·2	53·3	1·8	8·9	0·0	94	105·6	47·2	0·5	12·6	0·216	0·7	wP, sN : vP
16	..	29·359	64·4	49·9	14·5	55·9	− 1·4	54·4	53·0	2·9	8·8	0·0	90	110·5	41·7	2·9	12·6	0·028	0·0	vP : mP
17	..	29·674	66·2	48·8	17·4	57·4	+ 0·3	55·3	53·4	4·0	10·5	0·0	87	103·6	40·7	2·0	12·5	0·000	0·5	vP, wN : vP
18	In Equator Full	29·590	62·9	48·3	14·6	55·2	− 1·7	53·2	51·3	3·9	9·1	0·8	87	109·1	43·6	3·5	12·4	0·436	2·8	vP, sN : sN, mP
19	..	29·558	57·2	44·8	12·4	50·5	− 6·3	48·4	46·2	4·3	11·4	1·0	86	84·0	41·9	3·3	12·3	0·153	3·8	mP, vN : sP
20	..	29·688	62·6	43·2	19·4	51·8	− 4·8	48·3	44·8	7·0	16·3	0·9	77	110·5	39·2	8·6	12·3	0·000	0·0	sP : vP, wN
21	..	29·776	58·7	47·4	11·3	52·6	− 3·8	52·1	51·6	1·0	3·8	0·0	96	85·5	43·3	0·2	12·2	0·035	0·0	mP : vP, wN
22	..	29·828	71·0	50·5	20·5	60·0	+ 3·8	58·0	56·2	3·8	9·7	0·0	88	114·7	46·4	3·2	12·2	0·000	3·0	mP : mP
23	..	29·940	66·4	60·0	6·4	62·0	+ 5·9	60·1	58·5	3·5	8·3	1·1	89	83·0	58·0	0·3	12·1	0·003	0·0	wP, wN : wN, vP
24	..	29·938	65·3	55·2	10·1	60·2	+ 4·3	59·4	58·7	1·5	4·8	0·0	95	80·1	48·9	0·3	12·0	0·000	0·0	wP, wN : vP, wN
25	Greatest Declination N	29·926	69·1	53·4	15·7	59·7	+ 3·9	57·4	55·4	4·3	12·2	0·0	86	127·5	47·0	3·7	11·9	0·000	0·0	mP : vP
26	Apogee Last Quarter	30·002	71·4	54·6	16·8	61·2	+ 5·5	59·0	57·1	4·1	11·7	0·2	87	116·0	49·2	1·5	11·9	0·000	0·0	sP : mP
27	..	30·135	73·5	54·6	18·9	61·4	+ 5·9	59·3	57·5	3·9	13·5	0·0	87	121·0	46·2	6·4	11·8	0·000	0·0	mP : mP
28	..	30·259	67·7	50·3	17·4	57·2	+ 1·8	56·8	56·4	0·8	5·9	0·0	97	87·2	44·0	1·5	11·7	0·000	0·0	vP, wN : wN, mP
29	..	30·293	64·4	47·5	16·9	56·0	+ 0·8	55·3	54·7	1·3	7·0	0·0	95	107·1	39·0	1·7	11·7	0·000	0·0	vP : vP
30	..	30·204	62·7	45·5	17·2	54·1	− 0·8	53·0	51·9	2·2	8·0	0·0	92	90·5	37·2	2·3	11·6	0·000	0·0	vP, wN : wN, vP
Means	..	29·804	69·6	52·1	17·5	59·7	+ 2·3	57·2	55·1	4·7	12·6	0·3	85·2	112·9	46·1	4·0	12·6	Sum 4·002	2·2	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The results apply to the civil day.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers.

The values given in Columns 3, 4, 5, 14, and 15 are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was 29in·804, being 0in·017 *higher* than the average for the 20 years, 1854–1873.

Temperature of the Air.

The highest in the month was 87°·2 on September 4; the lowest in the month was 43°·2 on September 20; and the range was 44°·0.

The mean of all the highest daily readings in the month was 69°·6, being 2°·1 *higher* than the average for the 39 years, 1841–1879.

The mean of all the lowest daily readings in the month was 52°·1, being 3°·0 *higher* than the average for the 39 years, 1841–1879.

The mean daily range was 17°·5, being 0°·9 *less* than the average for the 39 years, 1841–1879.

The mean for the month was 59°·7, being 2°·3 *higher* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1880.	Wind as deduced from Self-Registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
Sept. 1	SW : WSW	WSW : SW	1·1	0·0	0·0	202	0 : 1, ci, slt.-h	3, ci.-cu, ci : 0
2	SW	WSW : SW	0·0	0·0	0·0	161	p.-cl : 7, ci, ci.-cu	2, ci, ci.-cu : 0
3	SW : Calm : SE	SSE : SE	0·0	0·0	0·0	120	0 : 0	0 : 0
4	Calm : SE	S : SSW	1·8	0·0	0·0	178	0 : 0	1, ci.-cu : 0
5	SW	SW	3·5	0·0	0·4	343	0 : 4, cu. ci.-cu	5, cu.-s, cu : 4, cu.-s, slt.-r
6	WSW : SW	WSW : Calm : N	0·3	0·0	0·0	128	p.-cl : 8, ci.-s, ci	9,cu.-s,ci.-cu: 10, th.-r : 10, r
7	NNE : N	NNW : NE	0·0	0·0	0·0	142	10, r : 3, ci, ci.-s	6, cu, ci.-cu, cu.-s : 0, m
8	Calm : NE	E : ENE	1·5	0·0	0·0	170	0 : 4, ci, ci.-s	9, cu.-s, th.-cl : 5, cu.-s, th.-cl
9	ENE : ESE	E : ESE	1·1	0·0	0·0	166	p.-cl : 9, slt.-r	10 : 7, m.-r
10	ESE : SE : SSE	S : SSW	3·0	0·0	0·2	195	p.-cl : 4, cu.-s, ci.-cu	5, cu.-s, ci.-cu, ci : 10
11	S : SSW	SSW : NNE : NNW	1·5	0·0	0·1	221	10, slt.-r : 9, cu.-s, ci.-cu	9,ci.-cu,cu.-s,r: 10, c.-r : 10, c.-r
12	W : WSW : SW	SSW : S : SSE	4·8	0·0	0·4	325	10, r : 8, cu.-s, ci.-cu	7, cu.-s, ci.-cu : 4, cu.-s, li.-cl, slt.-r
13	SSE : WSW	WSW	1·6	0·0	0·0	262	v, r : 7, cu.-s	6,t.-sm,hl,hy.-r: 4, li.-cl : 0, lu.-ha, l
14	SSE : SE	SSE : S	6·2	0·0	0·6	299	10 : 10, fq.-r	9, shs.-r : 10, hy.-shs
15	S : W	WSW : SW	4·7	0·0	0·4	287	10, r : 10, shs.-r	9,cu.-s,ci.-cu,ci,sh.-r: 7, cu.-s, ci.-cu
16	SSW : SE : NE	NE : ENE : Calm	3·1	0·0	0·2	211	p.-cl : 8, cu.-s, ci.-cu, slt.-sh	9, cu.-s, ci.-cu, sh.-r: 1, ci, m
17	NNE : NW	WNW : SW	0·5	..	..	222	p.-cl : 8, cu.-s, ci.-cu, cu	9, cu.-s, ci.-cu : 10
18	SW	SSW : SW	8·2	..	..	412	10 : 10, r	9, t.-sm, hl. r : 0
19	SW : WSW	WSW : W	3·2	..	..	348	v : 10, fq.-r	10, th.-cl : 0 : 0, slt.-m
20	W : WNW	WNW : W : WSW	4·4	..	..	360	0 : 3, cu. ci.-cu	5, cu, ci.-cu : 3, ci.-cu, cu : 1,ci.-cu,slt.-m
21	SW	SW : SSE	0·0	0·0	0·0	124	v : 10, th.-r	10, th.-r, glm : 10, m
22	SW	WSW : W	5·6	..	..	404	10 : 10	7, ci.-cu, cu.-s, cu, ci: 10
23	WNW : N	NW : SW	0·0	0·0	0·0	154	10 : 10, f, glm	7, cu.-s, ci.-cu, ci : 10, slt.-f
24	SW	NE : WSW	0·0	0·0	0·0	66	10, f : 8, f	9, ci.-cu, f : 9, m
25	WSW	WSW : SW	0·0	0·0	0·0	124	p.-cl : 5, cu.-s, ci.-cu	9 : 10, l
26	ENE : NE	NE : NNE	0·0	0·0	0·0	71	10 : 9, ci.-cu	7, ci.-cu, cu, cu.-s : 9, ci.-cu, slt.-h
27	NNE	E : SE	0·0	0·0	0·0	82	p.-cl : 4, ci.-cu, slt.-m	3, ci.-cu : 0, m
28	Calm	Calm : NE	0·0	0·0	0·0	58	0, f : tk.-f	0, f : 0, f
29	Calm : ENE	ENE : E : Calm	0·0	0·0	0·0	82	f : 9, f	8, ci.-cu, cu.-s : 0
30	Calm	Calm : N : E	0·0	0·0	0·0	53	p.-cl : 10, slt.-f	5, ci.-cu, h : 0, h : 0, h
Means	...	...	..	..	0·1 (25dys.)	199		
Number of Column for Reference.	21	22	23	24	25	26	27	28

The mean *Temperature of Evaporation* for the month was 57°·2, being 2°·9 *higher* than
The mean *Temperature of the Dew Point* for the month was 55°·1, being 3°·7 *higher* than
The mean *Degree of Humidity* for the month was 85·2, being 5·1 *greater* than
The mean *Elastic Force of Vapour* for the month was 0^in·434, being 0^in·055 *greater* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 4^grs·8, being 0^gr·6 *greater* than
The mean *Weight of a Cubic Foot of Air* for the month was 530 grains, being 2 grains *less* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 6·1.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·32. The maximum daily amount of *Sunshine* was 10·9 hours on September 3.

The highest reading of the *Solar Radiation Thermometer* was 143°·2 on September 4; and the lowest reading of the *Terrestrial Radiation Thermometer* was 37°·2 on September 8 and 30.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 1·2; for the 6 hours ending 3 p.m., 0·6; and for the 6 hours ending 9 p.m., 0·4.

The *Proportions of Wind* referred to the cardinal points were N. 5, E. 5, S. 9, and W. 10. Three days were calm.

The *Greatest Pressure of the Wind* in the month was 8^lbs·2 on the square foot on September 18. The mean daily *Horizontal Movement of the Air* for the month was 199 miles; the greatest daily value was 412 miles on September 18; and the least daily value 53 miles on September 30.

Rain fell on 12 days in the month, amounting to 4^in·002, as measured in the simple cylinder gauge partly sunk below the ground; being 1^in·751 *greater* than the average fall for the 39 years, 1841–1879.

MONTH and DAY, 1880.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Of the Air. Lowest.	Of the Air. Daily Range.	Of the Air. Mean of 24 Hourly Values.	Of the Air. Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	hours.	hours.	in.		
Oct. 1	..	30·043	64·1	48·2	15·9	54·8	+ 0·1	53·6	52·4	2·4	10·1	0·0	92	94·0	38·5	4·2	11·6	0·000	0·0	mP, wN : mP
2	In Equator	29·766	66·1	41·5	24·6	53·4	− 1·0	51·5	49·6	3·8	9·3	0·0	87	106·8	37·0	2·6	11·5	0·205	1·0	mP : mN, mP
3	..	29·745	54·2	34·1	20·1	44·1	− 9·9	41·0	37·4	6·7	12·8	0·5	76	96·8	30·8	6·6	11·4	0·000	3·0	sP : vP
4	New	29·554	47·1	37·3	9·8	42·5	−11·2	41·6	40·5	2·0	4·6	0·0	93	61·0	32·3	0·0	11·4	0·239	1·5	sP : sN, mP
5	..	29·134	66·3	46·0	20·3	56·4	+ 3·0	55·2	54·1	2·3	6·7	0·0	92	98·7	43·0	0·2	11·3	0·462	8·5	wP : wN, wP
6	..	29·214	53·5	50·0	3·5	51·0	− 2·0	50·7	50·4	0·6	2·8	0·0	98	60·0	49·2	0·0	11·2	0·540	0·0	wP : wP, mN
7	..	29·415	66·2	49·1	17·1	54·8	+ 2·1	53·2	51·6	3·2	14·4	0·0	89	102·6	38·9	3·0	11·2	0·336	0·0	wN, wP : mP
8	Perigee Greatest Decl. S	29·567	60·5	49·0	11·5	52·4	− 0·1	51·5	50·6	1·8	6·8	0·0	94	108·8	39·9	1·1	11·1	0·553	0·0	sP, mN : vP
9	..	29·542	54·0	47·4	6·6	50·9	− 1·4	50·5	50·1	0·8	2·7	0·0	97	64·0	46·6	0·0	11·0	1·142	1·3	wP, wN : vN, vP
10	..	29·784	54·4	50·0	4·4	51·7	− 0·4	51·3	50·9	0·8	2·6	0·0	97	72·8	48·3	0·0	11·0	1·224	3·7	vN, vP : wP, wN
11	First Qr.	30·074	58·5	43·0	15·5	50·0	− 1·9	48·1	46·1	3·9	10·8	1·3	87	108·7	35·8	3·6	10·9	0·036	0·0	mP : sP, mN
12	..	29·992	54·0	42·2	11·8	47·2	− 4·5	45·1	42·8	4·4	9·4	1·8	85	95·8	32·3	2·2	10·9	0·044	0·0	sP, mN : ssP
13	..	30·089	56·2	45·8	10·4	50·0	− 1·6	47·6	45·1	4·9	11·6	2·3	84	87·2	37·4	2·9	10·8	0·000	0·0	sP : ssP
14	..	30·210	51·9	36·7	15·2	46·5	− 4·9	44·2	41·6	4·9	10·4	0·0	84	86·6	32·8	1·8	10·7	0·000	0·0	sP : vP, wN
15	In Equator	30·106	53·3	32·7	20·6	43·2	− 8·1	42·8	42·3	0·9	5·7	0·0	97	88·3	29·4	0·1	10·7	0·000	0·0	vP : sP
16	..	29·916	53·4	44·5	8·9	49·3	− 1·9	48·6	47·9	1·4	4·8	0·0	95	68·2	34·0	0·0	10·6	0·000	0·0	wP : mP
17	..	29·925	57·2	47·0	10·2	50·3	− 0·8	49·0	47·6	2·7	9·2	0·2	91	70·5	44·0	0·0	10·5	0·000	0·0	mP : vP
18	Full	29·882	58·1	45·5	12·6	49·5	− 1·5	48·1	46·6	2·9	8·0	0·4	90	71·0	40·5	3·4	10·5	0·000	0·0	mP : sP
19	..	29·837	48·3	39·5	8·8	45·2	− 5·6	43·7	42·0	3·2	6·9	0·7	89	70·3	39·0	0·2	10·4	0·086	0·0	vP, wN : vP
20	..	29·500	39·5	32·5	7·0	35·2	−15·4	35·1	34·9	0·3	2·6	0·0	99	43·2	31·2	0·0	10·3	0·725	0·0	vN, sP : ssP
21	..	29·638	47·1	30·4	16·7	38·4	−12·0	36·7	34·4	4·0	8·0	1·7	86	81·2	26·1	2·6	10·3	0·000	0·0	sP : ssP
22	Greatest Declination N	29·552	46·1	38·0	8·1	41·9	− 8·2	39·9	37·4	4·5	10·3	0·0	86	66·1	34·9	0·0	10·2	0·330	0·8	ssN, vP : vP, ssN
23	..	29·674	46·6	34·5	12·1	41·0	− 8·7	39·3	37·2	3·8	9·9	0·7	86	82·3	29·3	0·9	10·2	0·206	3·2	vN, wP : sP
24	Apogee	30·072	46·9	29·5	17·4	38·9	−10·5	36·6	33·5	5·4	11·3	0·0	82	81·2	25·3	5·4	10·1	0·000	0·0	ssP : sP
25	..	29·982	49·2	33·1	16·1	41·9	− 7·2	40·6	39·0	2·9	5·9	0·5	90	70·1	27·0	0·5	10·0	0·000	0·0	sP : sP
26	Last Qr.	29·460	42·1	39·0	3·1	40·8	− 8·0	40·4	40·0	0·8	3·9	0·0	97	52·6	36·8	0·3	10·0	0·641	0·0	sP, ssN : mN, vP
27	..	29·132	58·2	41·1	17·1	50·4	+ 1·9	49·8	49·2	1·2	6·1	0·0	96	70·6	41·0	0·0	9·9	0·485	2·0	wN, wP : wP, wN
28	..	28·785	55·5	39·6	15·9	48·8	+ 0·6	46·6	44·3	4·5	8·2	0·4	85	71·5	39·0	0·1	9·8	0·511	6·0	vN, vP : vN, wP
29	In Equator	29·395	43·5	36·0	7·5	39·1	− 8·8	37·8	36·1	3·0	7·5	0·5	90	54·7	29·5	0·0	9·8	0·088	0·0	vN, vP : sP, sN
30	..	29·950	47·9	29·2	18·7	37·3	−10·3	35·7	33·5	3·8	11·4	0·0	86	71·3	24·0	3·9	9·7	0·000	0·0	sP : vP
31	..	29·921	51·1	33·0	18·1	41·3	− 6·0	39·2	36·6	4·7	10·7	0·5	84	78·1	28·6	7·0	9·7	0·000	0·0	ssP : ssP
Means	..	29·705	53·3	40·2	13·1	46·4	− 4·7	45·0	43·4	3·0	7·9	0·4	89·8	78·5	35·6	1·7	10·6	Sum 7·653	1·0	....
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The results apply to the civil day.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The result on October 3 for Evaporation Temperature depends partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, and 15 are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was 29in·705, being 0in·015 *lower* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 66°·3 on October 5; the lowest in the month was 29°·2 on October 30; and the range was 37°·1.
The mean of all the highest daily readings in the month was 53°·3, being 5°·0 *lower* than the average for the 39 years, 1841–1879.
The mean of all the lowest daily readings in the month was 40°·2, being 3°·5 *lower* than the average for the 39 years, 1841–1879.
The mean daily range was 13°·1, being 1°·5 *less* than the average for the 39 years, 1841–1879.
The mean for the month was 46°·4, being 4°·7 *lower* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1880.	Wind as deduced from Self-registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
Oct. 1	E : Calm	SW	0·5	0·0	0·0	120	v : v, f, glm	0, h : 0, slt.-h, d
2	WSW	WSW : W : NNW	5·3	0·0	0·5	320	0 : v, ci.-cu, ci.-s, ci	9,cu.-s,ci.-cu,r,glm : 10, fq.-r : 2
3	WSW : NW	W : NW : SW	0·8	0·0	0·1	252	0 : 0, h	6, ci.-cu, cu.-s : 0
4	SW : ENE	E : ESE	3·3	0·0	0·2	197	v : 10	10, r : 10, c.-r
5	ESE : SSW	SSW	8·8	0·0	1·2	404	10, oc.-shs : 9, cu.-s, shs.-r, w	9, cu.-s, shs.-r, w : v, cu.-s, n
6	S : N : NNE	NE	0·5	0·0	0·0	210	10 : 10, r : 10, m, slt.-r	10, fq.-r : 10, hy.-r
7	NE : E	S : E	0·2	0·0	0·0	149	10, hy.-r : 10	6, cu, ci.-cu, cu.-s, l : 1, d, slt.-m, l
8	ENE	ENE : NE	0·1	0·0	0·0	210	10, r, hl, l, t : 10, r	8,cu.-s,ci.-cu,ci,so.-ha : 10, shs.-r
9	NE	NE	15·0	0·0	2·2	531	10, r : 9, r	10, hy.-r, w : 10, c.-hy.-r, st.-w
10	NE : ENE	ENE : NE	14·0	0·0	0·9	374	10, c.-hy.-r : 10, hy.-r	10, r : 10, oc.-slt.-r
11	NE	NE : ENE	5·5	0·0	0·1	284	10 : 4, ci.-cu, ci, ci.-s	v, cu.-s, cu, ci, r : 0, d
12	NE : N	NNE : N	11·0	0·0	0·8	337	v : 10, li.-shs, st.-w	10, li.-shs : v, ci.-cu : 10
13	NNW : N : NNE	NNE	2·0	0·0	0·1	257	v : 3, ci.-cu, cu.-s, ci	8, cu.-s, ci.-cu : 10, slt.-f
14	N : NNE	N : W : S : Calm	0·0	0·0	0·0	106	10 : v, slt.-f	v, h : v, slt.-f
15	Calm : NE	ENE	0·0	0·0	0·0	95	tk.-f : 2, ci.-s, f, so.-ha	9,ci,ci.-s,slt.-h : v : 3,li.-cl,d,lu.-ha
16	ENE : NE	NNE	0·0	0·0	0·0	116	v : 10, m.-r, slt.-f	10 : 9, cu.-s, ci.-cu, slt.-f
17	NNE : Calm	WSW : SW	0·0	0·0	0·0	75	10 : 10, slt.-f	10, f : 10, f
18	SW : WSW	WSW	0·9	0·0	0·0	208	p.-cl, f : 7, ci.-cu, slt.-f	6,cu.-s,ci.-cu,slt.-f : p.-cl : 0, slt.-m
19	WSW : NNW : N : NNE	E : NE	2·0	0·0	0·0	199	v : 10, th.-r	10, th.-r : 10 : 10, hy.-r
20	NE : NNE	NNW	1·5	0·0	0·1	269	10, r, sn : 10, sn	10, sn, r : vv, ci.-cu
21	WNW : NNW : N	N : NNE : NE	1·1	0·0	0·0	271	p.-cl : 4, ci.-cu, ci.-s	v, ci, cu.-s, ci.-cu : 10
22	NE : ENE : E	ENE	6·0	0·0	0·6	335	10, r : 10, r	10, oc.-slt.-r : 10, oc.-slt.-r : 10, hy.-r
23	NE : ENE	NE : NNE : N	9·3	0·0	1·3	446	10, r : 10, fq.-r	v, cu.-s, ci, th.-cl, w : v
24	Variable : NNW	NNW : WSW	0·0	0·0	0·0	116	p.-cl, ho.-fr : 2, ci, ci.-cu, ho.-fr	f : f
25	WSW	SW	0·6	0·0	0·0	238	p.-cl : v, ci.-cu, ci, slt.-f	9, ci.-cu, cu.-s : 10, slt.-r
26	SW : ESE	E : NE	2·5	0·0	0·0	208	10 : 10, hy.-r	10, c.-r : 10, c.-r
27	NE : ESE	SSW : S	22·0	0·0	0·7	319	10, c.-hy.-r : 10, c.-r : 10, fq.-r	10, oc.-r : vv,hy.-sh,fq.-hy.-sqs
28	SW : SSW	WSW : W	19·0	0·0	2·5	622	10,fq.-hy.-sqs : 10, fq.-hy.-sqs,r : 10, r, w	10, sc, oc.-r, w : 10, oc.-r
29	W : NW : NNW	NNW	8·2	0·0	1·2	449	10, w, th.-r : 10, th.-r	10,cu.-s,ci.-cu,th.-cl,so.-ha : 0
30	NW : WSW	W : WSW	1·0	0·0	0·0	225	0, ho.-fr : 0, slt.-f, ho.-fr	1,ci.-cu,ci.-s,slt.-f,h : 0, ho.-fr
31	WSW	WSW	3·2	0·0	0·3	392	0, ho.-fr : 0, h	2,cu.-s,cu,h : 0, h : p.-cl
Means	...	...	..	..	0·4	269		
Number of Column for Reference.	21	22	23	24	25	26	27	28

The mean *Temperature of Evaporation* for the month was 45°·0, being 3°·9 *lower* than
The mean *Temperature of the Dew Point* for the month was 43°·4, being 3°·4 *lower* than
The mean *Degree of Humidity* for the month was 89·8, being 3·7 *greater* than
The mean *Elastic Force of Vapour* for the month was 0in·281, being 0in·040 *less* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 3grs·2, being 0gr·4 *less* than
The mean *Weight of a Cubic Foot of Air* for the month was 543 grains, being 4 grains *greater* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 7·1.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·16. The maximum daily amount of *Sunshine* was 7·0 hours on October 31.

The highest reading of the *Solar Radiation Thermometer* was 108°·8 on October 8; and the lowest reading of the *Terrestrial Radiation Thermometer* was 24°·0 on October 30.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 0·8; for the 6 hours ending 3 p.m., 0·2; and for the 6 hours ending 9 p.m., 0·0.

The *Proportions of Wind* referred to the cardinal points were N. 10, E. 9, S. 4, and W. 7. One day was calm.

The *Greatest Pressure of the Wind* in the month was 22lbs·0 on the square foot on October 27. The mean daily *Horizontal Movement of the Air* for the month was 269 miles; the greatest daily value was 622 miles on October 28; and the least daily value 75 miles on October 17.

Rain fell on 18 days in the month, amounting to 7in·653, as measured in the simple cylinder gauge partly sunk below the ground; being 4in·835 *greater* than the average fall for the 39 years, 1841–1879.

MONTH and DAY, 1880.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Of the Air. Lowest.	Of the Air. Daily Range.	Of the Air. Mean of 24 Hourly Values.	Of the Air. Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	hours.	hours.	in.		
Nov. 1	..	30·026	44·5	28·5	16·0	39·9	− 7·1	37·3	33·9	6·0	11·7	1·1	79	59·8	20·0	0·0	9·6	0·000	0·0	wN, vP : ssP
2	New	29·978	46·0	25·0	21·0	35·4	−11·3	33·6	30·8	4·6	11·9	0·0	83	92·4	16·3	4·9	9·5	0·000	0·0	ssP : ssP
3	..	30·029	47·6	32·9	14·7	38·5	− 7·9	36·2	33·1	5·4	11·6	0·3	82	95·1	26·4	6·3	9·5	0·000	0·0	sP : ssP
4	Perigee	30·212	46·6	29·9	16·7	37·7	− 8·3	35·3	32·0	5·7	12·1	0·7	80	81·6	19·8	6·0	9·4	0·000	1·0	sP : ssP
5	Greatest Declination S	30·187	44·5	29·8	14·7	38·3	− 7·3	37·5	36·4	1·9	4·8	0·0	93	47·8	24·1	0·0	9·4	0·000	0·0	ssP : vP
6	..	30·189	49·8	39·0	10·8	44·3	− 0·9	42·3	39·9	4·4	11·6	0·5	85	56·3	31·0	0·0	9·3	0·000	3·0	mP : ssP
7	..	30·054	52·4	43·6	8·8	47·7	+ 3·0	45·1	42·2	5·5	8·8	3·1	82	78·9	40·4	0·4	9·2	0·000	0·0	sP : ssP
8	..	30·079	49·5	32·5	17·0	43·9	− 0·4	41·6	38·9	5·0	9·9	0·8	82	77·8	26·0	5·1	9·2	0·100	0·0	vP : ssP
9	First Qr.	30·075	44·1	26·5	17·6	36·5	− 7·3	34·2	30·8	5·7	11·0	0·0	80	79·2	19·1	1·8	9·1	0·000	0·0	ssP : sP
10	..	29·896	49·4	38·1	11·3	44·7	+ 1·3	42·3	39·5	5·2	9·7	2·3	82	61·0	30·6	0·5	9·1	0·000	0·0	sP : vP
11	In Equator	29·907	52·6	41·6	11·0	49·0	+ 6·0	48·0	46·9	2·1	4·2	0·8	93	58·5	30·7	0·0	9·0	0·056	0·0	mP : sP
12	..	29·822	55·1	48·0	7·1	50·9	+ 8·3	49·2	47·4	3·5	8·6	1·3	88	64·9	43·9	0·0	9·0	0·070	1·2	vP, wN : vP
13	..	29·613	57·5	51·0	6·5	54·7	+12·4	52·5	50·4	4·3	5·1	2·8	85	66·1	47·9	0·0	8·9	0·006	5·8	mP : wP
14	..	29·224	56·5	53·0	3·5	54·7	+12·7	52·8	51·0	3·7	6·8	1·6	87	69·3	50·8	0·0	8·9	0·207	14·5	wP : vP, wN
15	..	29·357	53·3	40·2	13·1	43·2	+ 1·4	42·1	40·8	2·4	4·0	0·4	91	58·4	38·6	0·0	8·8	0·336	4·5	vP : ssN, ssP
16	Full	28·781	52·1	39·5	12·6	46·5	+ 4·9	44·2	41·6	4·9	8·2	0·2	84	84·1	37·0	2·2	8·8	0·206	3·0	vP, vN : vN, sP
17	..	28·972	45·2	31·5	13·7	39·1	− 2·4	36·7	33·6	5·5	9·2	0·7	81	69·6	26·0	3·3	8·7	0·000	0·0	sP : vP
18	Greatest Declination N	28·924	39·3	27·0	12·3	33·7	− 7·8	33·1	32·0	1·7	4·1	0·0	94	39·3	18·8	0·0	8·7	0·459	0·0	sP : ssN
19	..	29·175	43·1	33·1	10·0	38·2	− 3·2	36·6	34·4	3·8	6·4	1·0	86	71·2	28·0	0·4	8·6	0·163	0·0	ssN, mP : sP
20	Apogee	30·003	39·0	29·7	9·3	33·8	− 7·5	32·2	29·3	4·5	6·4	0·6	84	64·9	19·8	2·2	8·6	0·000	0·0	sP : sP
21	..	30·174	39·4	25·8	13·6	32·4	− 8·8	31·4	29·3	3·1	7·6	0·0	88	61·4	17·2	4·9	8·5	0·007	0·0	sP : ssP
22	..	29·796	33·8	26·0	7·8	30·2	−10·9	28·3	22·6	7·6	11·1	2·6	72	50·8	18·3	2·5	8·5	0·000	0·0	ssP : ssP
23	..	29·742	45·9	32·3	13·6	38·6	− 2·4	36·9	34·6	4·0	6·6	1·8	85	56·4	25·9	0·6	8·4	0·030	0·7	sP : vP, vN
24	..	29·733	52·4	45·6	6·8	48·9	+ 7·9	47·1	45·1	3·8	6·1	2·5	87	56·4	38·2	0·1	8·4	0·047	4·5	wP, wN : sP
25	Last Qr.	29·583	56·6	42·2	14·4	50·0	+ 9·1	47·4	44·6	5·4	9·0	2·0	82	96·2	36·7	2·7	8·3	0·221	8·8	mP : sP
26	In Equator	29·538	55·6	42·5	13·1	50·7	+ 9·9	48·6	46·4	4·3	7·4	1·6	86	62·5	36·1	0·0	8·3	0·152	7·5	wP : wP
27	..	29·879	52·3	40·6	11·7	46·9	+ 6·1	43·8	40·3	6·6	10·2	4·2	79	81·3	35·0	6·0	8·2	0·000	4·5	wP : sP
28	..	30·221	52·6	40·0	12·6	46·0	+ 5·1	44·1	41·9	4·1	8·2	1·3	87	76·0	34·0	2·1	8·2	0·000	0·7	mP : mP
29	..	30·250	51·1	42·2	8·9	46·1	+ 5·1	44·0	41·6	4·5	8·2	2·0	85	62·1	38·0	0·2	8·2	0·000	2·3	mP : mP
30	..	30·234	46·3	38·5	7·8	42·6	+ 1·4	41·5	40·2	2·4	5·9	0·4	91	73·7	32·3	2·1	8·1	0·000	0·0	mP : mP
Means	..	29·788	48·5	36·5	11·9	42·8	0·0	40·9	38·4	4·4	8·2	1·2	84·8	68·4	30·2	1·8	8·8	Sum 2·060	2·1	..
Number of Column for Reference	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The results apply to the civil day.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on November 21 for Air Temperature, and on November 21 and 22 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, and 15 are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was 29in·788, being 0in·017 *higher* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 57°·5 on November 13; the lowest in the month was 25°·0 on November 2; and the range was 32°·5.

The mean of all the highest daily readings in the month was 48°·5, being 0°·2 *lower* than the average for the 39 years, 1841–1879.

The mean of all the lowest daily readings in the month was 36°·5, being 0°·8 *lower* than the average for the 39 years, 1841–1879.

The mean daily range was 11°·9, being 0°·4 *greater* than the average for the 39 years, 1841–1879.

The mean for the month was 42°·8, being *the same as* the average for the 20 years, 1849–1868.

MONTH and DAY, 1880.	Wind as deduced from Self-registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
Nov. 1	WSW: NNW: N	N: NNE: NE	1·1	0·0	0·0	198	p.-cl : 10, cu.-s, slt.-f	10 : v : 0,ho.-fr,slt.-f
2	NE: ENE	ENE: E: NE	0·7	0·0	0·0	154	0, ho.-fr : 1, cu.-s, ho.-fr	2,ci,ci.-cu,ci.-s: p.-cl : 0
3	NE	NE	6·7	0·0	0·6	385	v : 7, cu.-s	2, ci.-cu : 0 : 0, a
4	NNE	NNE: NNW: N	1·6	0·0	0·0	197	0, ho.-fr : 0, ho.-fr, slt.-f	1, ci.-cu,th.-cl,ci.-s : 0, ho.-fr, slt.-f
5	SW	SW: W: NW	0·0	0·0	0·0	178	ho.-fr : 10, tk.-f	8, cu.-s, ci.-cu, f : 8, f
6	SW	WSW: SW	0·4	0·0	0·0	188	10 : 10	9, ci.-cu, cu : 10, slt.-r
7	WSW	SW	2·7	0·0	0·3	358	10 : 8, ci.-cu, ci.-s	8, ci.-cu, ci.-s : 10, lu.-ha
8	WSW: NNW: N	N	3·3	0·0	0·4	282	10, r : v : 2, th.-cl	3,ci.-cu,cu.-s,ci: li.-cl : 1,slt.-m,ho.-fr
9	NNW: SW	SW: WSW	7·0	0·0	0·8	314	ho.-fr : v, ci.-s, slt.-m, ho.-fr	8, ci.-s, ci.-cu, slt.-m : 8, cu.-s, ci.-cu
10	WSW:NW:NNW	NNW: SSW: S	8·8	0·0	0·4	260	p.-cl : v, th.-cl, m, slt.-f	9, m, slt.-f, glm : 4, li.-cl. f
11	SSW: SW	SSW: SW	1·0	0·0	0·0	300	p.-cl : 10, oc.-r	10, oc.-th.-r : 10
12	SW	WSW: SW	3·4	0·0	0·3	396	10 : 10, r	10, th.-cl : 10, th.-cl, lu.-ha
13	SW	SW	13·5	0·1	3·9	705	10 : 10, w, slt.-r	10, st.-w : 10,oc.-th.-r,st.-w : 10, st.-w
14	SW	SW: W	13·5	0·0	3·9	685	10, st.-w : 10, sc, th.-r, st.-w	10, fq.-r, sc, sqs : 10, fq.-r, w
15	N	SE: NE: SW	7·0	0·0	0·2	226	10 : 10, slt.-r	10, r : 10, c.-r : 9, lu.-ha
16	SE: SSW	SW	23·0	0·0	3·0	640	10 : 10, hy.-r : 9,sh.-r,st.-w	6, cu, cu.-s, shs.-r, g: 9
17	WSW: SSW	WNW: WSW	1·6	0·0	0·1	286	v : 3,ci.-cu,li.-cl,slt.-h,slt.-m	3,cu,ci.-cu,m,h: 0, h : 0, ho.-fr
18	SW: E	ENE	14·0	0·0	1·2	337	0, ho.-fr : 8, ho.-fr, f	9, r, sn : 10,c.-r,st.-w: 10, c.-r, w
19	N: NNW	N: NNE	9·0	0·0	1·0	399	10,st.-w,c.-r : 10, slt.-r : 10,sh.-r,so.-ha	6,ci.-s,so.-ha: v, slt.-r : 0, ho.-fr
20	NNE	NE: SE	0·8	0·0	0·0	223	p.-cl : 6,cu.-s, ci.-cu,slt.-sn	7,ci.-cu,cu.-s: 0, m, ho.-fr: 0
21	NNE	ENE: NNE	1·5	0·0	0·0	180	0 : slt.-sn : 0, ho.-fr	1, ci.-cu, ci : 0 : 0, ho.-fr
22	N: WSW	WSW: SSE	0·0	0·0	0·0	164	0 : 0, f	7,li.-cl,ci.-cu,cu.-s,h: 0 : 3, ci.-cu
23	SSE: SE: S	S: SSW	0·9	0·0	0·0	252	v : 10, slt.-sn	9, slt.-r : 9, oc.-r
24	SSW	SSW	8·2	0·0	1·1	490	p.-cl : 8, ci.-cu, r, w	9, r, w : 10
25	SSW: SW: WSW	WSW: SSW	23·0	0·0	3·3	663	10, st.-w : v, ci.-cu, sh.-r, st.-w	v, cu.-s, hy.-sqs, hl, l, t : 0
26	S: SSW	SW	17·0	0·0	2·4	627	v : 10, sc, oc.-r, st.-w	10, sc, r, w : 0, w
27	SSW: SW	SW	5·6	0·0	0·9	430	p.-cl : 0	1, ci, ci.-cu : 0 : 0
28	S: SSW	SSW	3·7	0·0	0·4	428	v : 7, ci.-s, ci.-cu	6, ci.-s, ci.-cu : 2, ci.-s
29	SSW: SW	SW: SSW	2·2	0·0	0·2	320	p.-cl : v, ci.-cu, ci.-s	9, ci.-cu, ci : v : 8, d
30	SSW	SSW	1·2	0·0	0·0	274	p.-cl : 7, ci.-cu	6, ci.-cu, cu.-s : 10
Means	...	...	..	..	0·8	351		
Number of Column for Reference.	21	22	23	24	25	26	27	28

The mean *Temperature of Evaporation* for the month was 40°·9, being 0°·3 *lower* than
The mean *Temperature of the Dew Point* for the month was 38°·4, being 0°·9 *lower* than
The mean *Degree of Humidity* for the month was 84·8, being 2·5 *less* than
The mean *Elastic Force of Vapour* for the month was 0in·232, being 0in·008 *less* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 2grs·7, being 0gr·1 *less* than
The mean *Weight of a Cubic Foot of Air* for the month was 549 grains, being *the same as*
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 6·2.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·20. The maximum daily amount of *Sunshine* was 6·3 hours on November 3.

The highest reading of the *Solar Radiation Thermometer* was 96°·2 on November 25; and the lowest reading of the *Terrestrial Radiation Thermometer* was 16°·3 on November 2.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 1·6; for the 6 hours ending 3 p.m., 0·3; and for the 6 hours ending 9 p.m., 0·2.

The *Proportions of Wind* referred to the cardinal points were N. 7, E. 3, S. 11, and W. 9.

The *Greatest Pressure of the Wind* in the month was 23lbs·0 on the square foot on November 16 and 25. The mean daily *Horizontal Movement of the Air* for the month was 351 miles; the greatest daily value was 705 miles on November 13; and the least daily value 154 miles on November 2.

Rain fell on 14 days in the month, amounting to 2in·060, as measured in the simple cylinder gauge partly sunk below the ground; being 0in·173 *less* than the average fall for the 39 years, 1841–1879.

MONTH and DAY, 1880.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Of the Air. Lowest.	Of the Air. Daily Range.	Of the Air. Mean of 24 Hourly Values.	Of the Air. Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Difference. Greatest of 24 Hourly Values.	Difference. Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with Blackened Bulb in vacuo placed on the Grass.	TEMPERATURE. Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	hours	hours	in.		
Dec. 1	..	29·993	49·3	43·4	5·9	46·3	+ 4·8	45·5	44·6	1·7	3·2	0·0	94	52·5	42·6	0·0	8·1	0·038	0·0	mP : mP
2	New : Greatest Declination S.	30·073	46·3	28·3	18·0	38·6	− 3·2	38·1	37·5	1·1	4·0	0·0	96	49·2	25·0	0·0	8·1	0·003	0·0	mP : sP, wN
3	Perigee	30·153	48·7	26·7	22·0	40·8	− 1·3	40·2	39·5	1·3	3·6	0·0	95	55·8	22·7	0·0	8·0	0·003	0·0	vP : mP
4	..	30·271	50·9	43·1	7·8	47·4	+ 5·0	45·7	43·8	3·6	4·6	1·9	88	55·0	34·5	0·0	8·0	0·000	1·0	mP : vP
5	..	30·321	51·1	43·6	7·5	47·6	+ 5·0	45·5	43·2	4·4	6·9	2·2	86	58·8	35·0	0·0	8·0	0·000	5·0	sP : sP
6	..	30·312	51·9	47·2	4·7	49·1	+ 6·4	47·8	46·4	2·7	4·0	1·5	91	57·0	44·7	0·0	8·0	0·000	4·0	wP : sP
7	..	30·450	52·3	44·0	8·3	47·6	+ 4·8	46·5	45·3	2·3	5·0	1·3	92	67·0	39·0	0·0	7·9	0·000	0·0	mP : vP
8	First Quarter : In Equator	30·399	49·7	46·0	3·7	47·9	+ 5·1	46·1	44·1	3·8	7·4	1·5	87	52·5	45·4	0·3	7·9	0·000	0·0	mP : vP
9	..	30·238	51·2	44·2	7·0	48·1	+ 5·3	46·1	43·9	4·2	5·8	2·5	86	56·6	39·0	0·0	7·9	0·000	0·0	mP : sP
10	..	30·138	55·8	42·5	13·3	49·4	+ 6·7	46·8	44·0	5·4	9·7	2·1	82	67·1	37·0	2·1	7·9	0·000	0·0	sP : vP
11	..	30·080	46·1	36·5	9·6	41·6	− 0·9	40·4	38·9	2·7	5·1	0·7	91	57·7	30·7	2·8	7·8	0·000	0·5	ssP : ssP
12	..	29·945	48·8	42·1	6·7	45·5	+ 3·3	42·8	39·7	5·8	10·9	1·5	81	65·2	38·1	3·1	7·8	0·000	1·5	sP : ssP
13	..	29·818	51·7	45·6	6·1	49·3	+ 7·5	46·5	43·5	5·8	7·2	4·4	81	68·2	38·5	0·0	7·8	0·000	0·0	mP : sP
14	..	29·774	50·8	37·6	13·2	43·7	+ 2·2	41·6	39·2	4·5	9·1	2·0	84	50·8	37·5	0·0	7·8	0·149	0·0	vP, wN : wN, vP
15	..	29·506	51·3	34·2	17·1	45·1	+ 4·0	44·1	42·9	2·2	7·2	0·6	92	53·4	34·2	0·0	7·8	0·390	0·8	mP, wN : wN, vP
16	Greatest Dec. N Full.	29·428	47·2	36·5	10·7	43·2	+ 2·4	42·1	40·8	2·4	3·6	1·1	91	51·2	34·5	0·0	7·8	0·166	2·2	mP, wN : mN, sP
17	..	29·550	39·1	36·0	3·1	37·6	− 2·9	35·6	32·9	4·7	8·4	1·4	83	44·2	32·7	0·0	7·7	0·010	0·0	sP : vP
18	Apogee	29·392	45·1	35·0	10·1	39·6	− 0·6	38·6	37·3	2·3	5·3	0·0	92	55·8	35·0	0·4	7·7	0·040	1·7	wN, vP : sP, vN
19	..	29·365	44·6	37·0	7·6	41·2	+ 1·2	38·5	35·1	6·1	10·4	2·8	85	55·2	34·5	0·6	7·7	0·000	5·3	mP, mN : ssP
20	..	29·322	41·2	33·2	8·0	36·5	− 3·3	36·3	36·0	0·5	2·8	0·0	98	41·2	31·8	0·0	7·7	0·776	0·0	vN, sP : sN, sP
21	..	29·746	38·8	29·5	9·3	35·0	− 4·6	34·3	33·1	1·9	5·8	0·0	93	46·5	27·0	0·0	7·7	0·000	0·0	sP : vP
22	..	29·672	53·0	28·9	24·1	43·4	+ 4·0	42·6	41·6	1·8	3·9	0·0	94	53·0	26·4	0·0	7·7	0·436	1·7	sP, wN : mP
23	In Equator	29·328	53·6	48·5	5·1	51·3	+ 12·0	49·1	46·8	4·5	6·8	2·2	85	73·5	46·6	1·6	7·7	0·010	7·0	mP : vP, wN
24	Last Qr.	29·083	50·6	36·5	14·1	45·8	+ 6·5	43·5	40·9	4·9	7·8	1·9	84	72·0	34·0	2·8	7·7	0·027	5·3	mP : sP, mN
25	..	29·393	37·8	30·5	7·3	34·3	− 4·9	32·3	28·9	5·4	9·1	3·0	80	49·9	28·1	4·4	7·7	0·000	0·0	ssP : ssP
26	..	29·507	37·1	30·0	7·1	33·7	− 5·4	32·2	29·5	4·2	6·8	2·8	85	47·4	25·8	0·2	7·8	0·000	0·0	ssP : ssP
27	..	29·262	51·4	32·9	18·5	40·6	+ 1·6	40·3	40·0	0·6	4·6	0·0	98	62·3	32·2	0·4	7·8	0·360	1·3	mN, mP : vP, wN
28	..	29·412	53·5	49·3	4·2	50·9	+ 12·1	49·7	48·5	2·4	3·2	1·0	92	63·6	45·0	0·0	7·8	0·067	5·5	wP : mP
29	..	29·196	50·7	41·0	9·7	49·2	+ 10·5	47·6	45·9	3·3	4·4	2·3	89	51·8	39·5	0·0	7·8	0·244	12·5	wP : vN, wP
30	Greatest Declination	29·279	42·6	33·1	9·5	37·4	− 1·1	36·4	35·0	2·4	6·2	0·0	91	49·4	29·0	0·0	7·8	0·168	6·7	mP, vN : ssP
31	New · Perigee	29·901	35·1	32·1	3·0	34·1	− 4·2	33·2	31·6	2·5	5·3	0·0	90	48·1	28·2	0·5	7·8	0·118	0·0	ssP, mN : ssP
Means	..	29·752	47·7	37·9	9·8	43·3	+ 2·5	41·8	40·0	3·3	6·1	1·3	88·7	55·9	34·6	0·6	7·8	Sum 3·005	2·0	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

The results apply to the civil day.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on December 25 and 26 for Evaporation Temperature depend partly on values inferred from eye-observations on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, and 15 are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was 29in·752, being 0in·039 *lower* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 55°·8 on December 10; the lowest in the month was 26°·7 on December 3; and the range was 29°·1.
The mean of all the highest daily readings in the month was 47°·7, being 3°·4 *higher* than the average for the 39 years, 1841–1879.
The mean of all the lowest daily readings in the month was 37°·9, being 3°·0 *higher* than the average for the 39 years, 1841–1879.
The mean daily range was 9°·8, being 0°·4 *greater* than the average for the 39 years, 1841–1879.
The mean for the month was 43°·3, being 2°·5 *higher* than the average for the 20 years, 1849–1868.

MONTH and DAY. 1880.	Wind as deduced from Self-registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
Dec. 1	SW : SSW	SSW : SW	0·0	0·0	0·0	298	10 : 10	9, ci.-cu : 10, th.-r
2	NW : W : WSW	Calm : S	0·0	0·0	0·0	109	10 : 7, f	7, ci.-cu, slt.-f : 0, f, ho.-fr
3	Calm : SSW	SW : WSW	2·0	0·0	0·0	227	f : 10, slt.-f	10 : v, slt.-r
4	WSW	WSW	0·5	0·0	0·0	262	v : 10	9, slt.-f : v, li.-cl, hy.-d
5	WSW	SW	2·2	0·0	0·0	287	10 : 10	9, ci.-cu, cu.-s : 10
6	SW : WSW	WSW : W	1·5	0·0	0·0	355	10 : 10	9, ci, ci.-cu : 10
7	WNW : W : WSW	WSW : SW	0·0	0·0	0·0	167	10 : 10, slt.-f	9, th.-cl : 10
8	WSW	WSW : W	4·2	0·0	0·5	431	10 : 10, slt.-r	10 : 9
9	W : WSW	W : WSW	3·7	0·0	0·3	388	10 : 10, th.-cl	10, th.-cl : p.-cl, d, lu.-ha, lu.-co
10	WSW : W	W : NW	4·5	0·0	0·5	418	p.-cl : v	v, ci : v, lu.-co
11	WSW : SW	WSW : SW	2·4	0·0	0·1	326	v : 0, ho.-fr	vv : 2, ci.-s, lu.-co
12	WSW : W	WSW	4·4	0·0	0·7	470	p.-cl : 3, ci	7, ci, ci.-cu, cu.-s : 1, th.-cl, lu.-ha
13	WSW	WSW	8·0	0·1	2·2	614	p.-cl, w : 10, w	10, w : v, s, slt.-r
14	WSW : NW	NNW : NNE : E	8·8	0·0	0·9	366	10 : 10, r, w	10, m.-r : 10
15	SSE : SW	SW : WSW	7·0	0·0	1·1	431	10, r : 10, sc, r	10, sc, r, w : 9, sc
16	SW : WSW	WSW : NNE : NE	3·7	0·0	0·4	370	p.-cl : v, fq.-r	10, r, gt.-glm : 9, ci.-cu, cu.-s
17	ENE	ENE	5·5	0·0	0·8	376	10 : 10	10, slt.-sn : 10, slt.-sn
18	NE : N : WSW	SSW : SW	3·0	0·0	0·5	344	10 : 10, slt.-r	6, ci.-cu, ci, ci.-s, slt.-r : p.-cl, li.-cl, shs.-r
19	SSW : SW	WSW : SW	9·5	0·0	0·6	439	p.-cl : 7, cu.-s, ci.-cu, sh.-r, st.-w	7, cu.-s, ci.-cu : 8, ci.-s
20	SSW : NE	NE : N : NW : WSW	0·0	0·0	0·0	205	10, hy.-r : 10, th.-r, m	10, r, sl, sn : 10
21	WSW : NW	NNW : SW	2·3	0·0	0·1	258	p.-cl : 2, ci.-cu, slt.-f, ho.-fr	6, cu.-s, ci.-cu, th.-cl : 0, f, ho.-fr
22	S	SW	8·0	0·0	0·9	410	v : 10, r, w	10, c.-r : 10
23	SW : WSW	SW	11·0	0·0	1·7	585	10, st.-w : 6, ci.-s, cu.-s, st.-w	v, ci, ci.-cu, ci.-s : 10, li.-shs, w
24	SW : WSW	WSW : W	12·5	0·0	1·0	516	p.-cl, w : p.-cl, ci.-cu, cu.-s, r	v, ci.-cu, cu.-s, slt.-r, sq : 2, th.-cl
25	WSW	W : WNW : WSW	4·7	0·0	0·5	377	th.-cl, ho.-fr : 3, ci, ci.-cu, ho.-fr	2, th.-cl : 0, ho.-fr
26	SW : WSW	SW : ESE : SE	1·2	0·0	0·0	227	ho.-fr : 6, cu.-s, ci.-cu, ho.-fr	6, cu.-s : 10, ho.-fr
27	SE : E : SW	NE : SW	4·0	0·0	0·1	203	10, sl, r : 10	10, f, m.-r : 10, hy.-r, f, m.
28	SW	SSW	3·0	0·0	0·1	354	p.-cl : 4, li.-shs	9, ci.-cu, cu.-s, ci.-s, oc.-shs : 1, li.-cl
29	SSW : S	S : WSW	14·5	0·0	1·6	534	v : 10, r	10, sc, r, w : 10, shs.-r, st.-w
30	WSW : SW	N : NW	9·0	0·0	0·6	292	10, w : 10, r	10 : v, th.-cl, ho.-fr
31	W : NNW	NNW : WNW : WSW	2·0	0·0	0·1	269	v, sn : 10, sn	v, cu.-s, ci.-cu : 0, h
Means	...	...	..	..	0·5	352		
Number of Column for Reference.	21	22	23	24	25	26	27	28

The mean *Temperature of Evaporation* for the month was 41°·8, being 2°·5 *higher* than
The mean *Temperature of the Dew Point* for the month was 40°·0, being 2°·6 *higher* than
The mean *Degree of Humidity* for the month was 88·7, being 0·9 *greater* than
The mean *Elastic Force of Vapour* for the month was 0^{in}·247, being 0^{in}·023 *greater* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 2^{grs}·8, being 0^{gr}·2 *greater* than
The mean *Weight of a Cubic Foot of Air* for the month was 548 grains, being 3 grains *less* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 7·6.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·08. The maximum daily amount of *Sunshine* was 4·4 hours on December 25.

The highest reading of the *Solar Radiation Thermometer* was 73°·5 on December 23; and the lowest reading of the *Terrestrial Radiation Thermometer* was 22°·7 on December 3.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 1·6; for the 6 hours ending 3 p.m., 0·2; and for the 6 hours ending 9 p.m., 0·2.

The *Proportions of Wind* referred to the cardinal points were N. 3, E. 2, S. 11, and W. 15.

The *Greatest Pressure of the Wind* in the month was 14^{lbs}·5 on the square foot on December 29. The mean daily *Horizontal Movement of the Air* for the month was 352 miles; the greatest daily value was 614 miles on December 13; and the least daily value 109 miles on December 2.

Rain fell on 15 days in the month, amounting to 3^{in}·005, as measured in the simple cylinder gauge partly sunk below the ground; being 1^{in}·247 *greater* than the average fall for the 39 years, 1841–1879.

HIGHEST and LOWEST READINGS of the BAROMETER, reduced to 32° Fahrenheit, as extracted from the PHOTOGRAPHIC RECORDS.

MAXIMA.			MINIMA.		
Approximate Greenwich Mean Solar Time, 1880.		Reading.	Approximate Greenwich Mean Solar Time, 1880.		Reading.
	d h m	in.		d h m	in.
January	3. 13. 0	30·340	January	4. 2. 45	30·270
	6. 22. 30	30·505		9. 1. 50	30·360
	11. 22. 0	30·451		16. 6. 40	29·794
	16. 22. 15	29·910		17. 17. 0	29·786
	19. 22. 20	30·481		22. 2. 15	30·146
	23. 11. 20	30·335		25. 2. 10	29·987
	26. 20. 40	30·215		29. 18. 25	30·000
	30. 22. 50	30·226	February	1. 4. 0	30·135
February	2. 22. 35	30·310		7. 15. 40	29·215
	8. 11. 0	29·485		9. 8. 50	29·009
	11. 8. 50	29·685		11. 19. 30	29·606
	12. 23. 0	30·067		16. 2. 0	28·795
	16. 8. 40	28·915		16. 19. 0	28·685
	18. 4. 30:	29·275		18. 17. 15	29·120
	24. 21. 20	30·297		27. 18. 0	29·345
	28. 21. 45	29·512	March	1. 7. 20	29·204
March	1. 17. 25	29·330		2. 14. 30	29·066
	5. 19. 30	30·026		6. 15. 50	29·842
	7. 21. 20	30·330		9. 16. 55	29·955
	11. 9. 25	30·274		16. 5. 15	29·882
	18. 21. 0	30·230		20. 4. 30	30·082
	21. 21. 30	30·178		26. 4. 30:	29·868
	27. 21. 50	30·046		31. 11. 15	29·115
April	1. 10. 0	29·575	April	2. 3. 30	29·266
	2. 22. 0	29·423		4. 0. 40	29·098
	4. 16. 5	29·357		5. 18. 0:	29·115
	9. 8. 0	30·085		15. 5. 10	29·472
	16. 9. 30	29·750		17. 3. 0	29·665
	17. 21. 0	29·875		19. 14. 30	29·636
	20. 18. 0	29·900		21. 15. 0	29·610
	23. 12. 0	29·955		24. 14. 50	29·774

MAXIMA.			MINIMA.		
Approximate Greenwich Mean Solar Time, 1880.		Reading.	Approximate Greenwich Mean Solar Time, 1880.		Reading.
	d h m	in.		d h m	in.
April	26. 20. 0	30·020	April	28. 3. 0	29·871
	29. 21. 5	30·255	May	3. 3. 20	29·515
May	8. 22. 20	30·134		11. 4. 25	29·752
	13. 9. 30	30·000		15. 4. 0	29·866
	18. 12. 20	30·129		19. 6. ±	29·920
	20. 10. 35	30·128		22. 4. 0	29·614
	22. 19. 30	29·787		23. 16. 20	29·660
	24. 19. 50	29·913		26. 18. 30	29·515
	28. 20. 10	30·295	June	3. 16. 0	29·664
June	4. 23. 0	29·846		7. 1. 0	29·411
	7. 13. 55	29·668		8. 2. 55	29·520
	14. 12. 20	29·945		15. 19. 0	29·734
	16. 18. 0	29·976		20. 6. 0	29·447
	22. 10. 25	29·627		23. 15. 20:	29·545
	27. 9. 45	30·070	July	1. 0. 0	29·505
July	1. 21. 0	29·645		3. 5. 15	29·491
	4. 20. 0	30·014		7. 15. 30	29·444
	12. 11. 0:	30·006		14. 18. 10	29·714
	15. 21. 30	29·915		17. 16. 45	29·750
	20. 12. ±	29·945		21. 17. 0	29·792
	22. 11. 15	29·860		24. 4. 20	29·695
	24. 20. 25	29·775		26. 5. 0	29·295
	27. 8. 55	29·694		29. 0. 15	29·340
	29. 11. 55	29·544		29. 20. 45	29·406
	30. 23. 0	29·650	August	1. 2. 10	29·442
August	3. 9. 0	29·779		7. 9. 30	29·031
	9. 22. 0	30·135		16. 5. 45	29·880
	17. 10. 40	29·987		19. 5. 0	29·825
	20. 18. 30	29·957		25. 19. 45	29·724
	27. 21. 25	30·050		29. 15. 0	29·765
September	1. 20. 25	30·190	September	4. 3. 30	29·805

HIGHEST and LOWEST READINGS of the BAROMETER, reduced to 32° Fahrenheit, as extracted from the PHOTOGRAPHIC RECORDS—*continued.*

MAXIMA.		MINIMA.		MAXIMA.		MINIMA.	
Approximate Greenwich Mean Solar Time, 1880.	Reading.	Approximate Greenwich Mean Solar Time, 1880.	Reading.	Approximate Greenwich Mean Solar Time, 1880.	Reading.	Approximate Greenwich Mean Solar Time, 1880.	Reading.
d h m	in.	d h m	in.	d h m	in.	d h m	in.
September 5. 19. 10	29·998	September 6. 16. 0	29·774	November 10. 9. 0	29·995	November 14. 10. 30:	28·986
7. 10. 0	29·920	11. 12. 0	29·365	14. 22. 25	29·583	15. 6. 10	29·235
12. 0. 0	29·530	12. 15. 0	29·410	15. 10. 15	29·321	16. 2. 30	28·560
13. 8. 50	29·668	14. 15. 40	28·973	17. 16. 0	29·135	18. 11. 30	28·556
17. 8. 10	29·738	17. 23. 50	29·495	20. 15. 55	30·295	22. 19. 25	29·706
18. 11. 0	29·614	19. 2. 20	29·493	23. 12. 15	29·790	24. 18. 30	29·406
28. 23. 0	30·322	October 2. 3. 15	29·660	25. 10. 50	29·816	26. 0. 25	29·383
October 2. 13. 5	29·806	5. 2. 0	29·067	29. 11. 30	30·300	December 1. 6. 15	29·905
8. 9. 0	29·616	9. 3. 20	29·506	December 4. 14. 0	30·350	5. 17. 30	30·285
10. 22. 10	30·110	12. 2. 0	29·916	7. 10. 40	30·490	9. 23. 30	30·070
13. 21. 45:	30·240	16. 4. 30:	29·885	10. 10. 50	30·200	11. 16. 5	29·886
17. 9. 0	29·950	18. 13. 40	29·815	12. 5. 25	29·986	13. 15. 55	29·700
18. 22. 15	29·901	20. 3. 40	29·380	14. 10. 0	29·859	15. 5. 5	29·325
21. 8. 30	29·725	22. 8. 20	29·464	16. 21. 40	29·584	18. 5. 25	29·311
23. 23. 0	30·116	26. 15. 20	29·165	19. 4. 0	29·420	19. 17. 25	29·241
26. 22. 0	29·241	27. 22. 20	28·615	21. 9. 0	29·980	22. 16. 0	29·355
30. 9. 15	30·000	31. 10. 20	29·876	22. 22. 20	29·431	23. 18. 40	28·976
November 1. 8. 30	30·135	November 2. 8. 35	29·883	25. 11. 50	29·567	26. 19. 45	29·132
3. 22. 0	30·260	7. 15. 50	29·913	28. 10. 30	29·446	29. 8. 35	28·911
8. 9. 45	30·265	9. 13. 20	29·765				

The readings in the above table are accurate, but the times are occasionally liable to uncertainty, as the barometer will sometimes remain at its extreme reading without sensible change for a considerable interval of time. In such cases the time given is the middle of the stationary period, the symbol : denoting that the reading has been sensibly the same through a period of more than one hour.

ABSOLUTE MAXIMA AND MINIMA READINGS OF THE BAROMETER for each Month in the YEAR 1880.
[Extracted from the preceding Table.]

1880, MONTH.	Readings of the Barometer. Maxima.	Readings of the Barometer. Minima.	Range of Reading in each Month.
	in.	in.	in.
January	30·505	29·786	0·719
February	30·310	28·685	1·625
March	30·330	29·066	1·264
April	30·255	29·098	1·157
May	30·295	29·515	0·780
June	30·070	29·411	0·659
July	30·014	29·295	0·719
August	30·135	29·031	1·104
September	30·322	28·973	1·349
October	30·240	28·615	1·625
November	30·300	28·556	1·744
December	30·490	28·911	1·579

The highest reading in the year was 30in·505 on January 7. The lowest reading in the year was 28in·556 on November 18.
The range of reading in the year was 1in·949.

MONTHLY RESULTS of METEOROLOGICAL ELEMENTS for the YEAR 1880.

1880, Month.	Mean Reading of the Barometer.	Temperature of the Air. Highest.	Lowest.	Range in the Month.	Mean of all the Highest.	Mean of all the Lowest.	Mean Daily Range.	Monthly Mean.	Excess of Mean above Average of 20 Years.	Mean Temperature of Evaporation.	Mean Temperature of the Dew Point.	Mean Degree of Humidity. (Saturation = 100.)
	in.	°	°	°	°	°	°	°	°	°	°	
January ..	30·200	54·1	17·2	36·9	37·7	28·1	9·6	33·3	− 5·5	32·1	29·5	86·0
February ..	29·636	54·9	23·0	31·9	48·0	36·6	11·4	42·1	+ 2·4	40·5	38·7	88·4
March	29·935	61·4	27·4	34·0	53·1	36·9	16·2	44·2	+ 2·6	41·8	38·9	82·5
April	29·700	66·9	34·8	32·1	55·9	39·9	16·0	47·2	− 0·2	44·3	41·1	80·2
May	29·910	87·5	31·5	56·0	64·0	42·2	21·8	52·6	− 0·6	47·7	42·8	70·1
June	29·738	80·2	37·5	42·7	68·1	49·5	18·6	57·5	− 2·3	54·3	51·3	80·6
July	29·727	79·1	47·5	31·6	72·9	53·8	19·1	61·6	− 1·0	58·2	55·3	80·1
August ...	29·817	80·9	46·4	34·5	72·9	55·8	17·1	62·8	+ 0·9	59·8	57·3	82·7
September.	29·804	87·2	43·2	44·0	69·6	52·1	17·5	59·7	+ 2·3	57·2	55·1	85·2
October ...	29·705	66·3	29·2	37·1	53·3	40·2	13·1	46·4	− 4·7	45·0	43·4	89·8
November .	29·788	57·5	25·0	32·5	48·5	36·5	11·9	42·8	0·0	40·9	38·4	84·8
December .	29·752	55·8	26·7	29·1	47·7	37·9	9·8	43·3	+ 2·5	41·8	40·0	88·7
Means	29·809	Highest 87·5	Lowest 17·2	Annual Range 70·3	57·6	42·5	15·2	49·5	− 0·3	47·0	44·3	83·3

1880, Month.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a Cubic Foot of Air.	Mean Weight of a Cubic Foot of Air.	Mean Amount of Ozone.	Mean Amount of Cloud. (0–10.)	Rain. Number of Rainy Days.	Rain. Amount collected in a Gauge whose receiving Surface is 5 Inches above the Ground.	Wind. From Osler's Anemometer. Number of Hours of Prevalence of each Wind, referred to different Points of Azimuth. N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Number of Calm or nearly Calm Hours.	Mean Daily Pressure on the Square Foot.*	From Robinson's Anemometer. Mean Daily Horizontal Movement of the Air.
	in.	grs.	grs.				in.	h	h	h	h	h	h	h	h	h	lbs.	miles.
January ...	0·163	2·0	568	1·2	6·3	9	0·261	60	65	113	72	95	152	78	18	91	0·10	179
February ..	0·235	2·7	547	5·0	6·9	18	2·357	44	36	8	33	154	289	92	21	19	0·41	346
March	0·237	2·7	550	5·0	6·1	4	0·595	12	183	264	32	26	127	61	8	31	0·93	321
April	0·258	3·0	543	6·4	7·4	16	2·205	85	180	39	28	70	182	104	24	8	0·31	333
May	0·275	3·1	541	3·9	6·4	4	0·497	141	258	67	28	41	89	56	34	30	0·44	281
June	0·378	4·2	532	3·1	7·8	20	2·257	124	96	45	25	68	223	88	47	4	0·18	252
July	0·437	4·8	527	5·9	7·2	24	3·812	34	32	43	31	136	352	86	23	7	0·19	258
August ...	0·470	5·2	527	0·7	7·3	6	0·978	140	291	66	7	35	91	62	32	20	0·13	235
September.	0·434	4·8	530	2·2	6·1	12	4·002	32	73	55	65	69	236	94	29	67	0·09	199
October ...	0·281	3·2	543	1·0	7·1	18	7·653	112	205	82	13	32	150	73	51	26	0·41	269
November .	0·232	2·7	549	2·1	6·2	14	2·060	84	105	15	18	103	314	45	35	1	0·81	351
December .	0·247	2·8	548	2·0	7·6	15	3·005	33	45	16	20	63	348	165	42	12	0·49	352
Sums	..	..	..	..	..	160	29·682	901	1569	813	372	892	2553	1004	364	316	..	..
Means	0·304	3·4	542	3·2	6·9	..	..	..	..	..	..	..	..	..	..	..	0·37	281

The greatest recorded pressure of the wind on the square foot in the year was 35 lbs. + on March 2.
The greatest recorded daily horizontal movement of the air „ „ 954 miles on March 2.
The least recorded daily horizontal movement of the air „ „ 33 miles on January 29.

* The mean daily pressures for February, March, April, May, and September depend respectively on the records for 12, 26, 13, 30, and 25 days only.

MONTHLY MEAN READING of the BAROMETER at every HOUR of the DAY, as deduced from the PHOTOGRAPHIC RECORDS.

Hour, Greenwich Mean Solar Time (Civil reckoning).	1880.												Yearly Means.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Midnight	30·191	29·654	29·939	29·697	29·928	29·757	29·736	29·818	29·800	29·710	29·787	29·767	29·815
1h. a.m.	30·188	29·648	29·937	29·693	29·923	29·751	29·733	29·814	29·798	29·709	29·781	29·760	29·811
2 "	30·191	29·641	29·935	29·690	29·916	29·745	29·726	29·812	29·794	29·703	29·779	29·758	29·807
3 "	30·187	29·632	29·928	29·688	29·912	29·740	29·723	29·810	29·789	29·700	29·777	29·754	29·803
4 "	30·185	29·629	29·929	29·685	29·910	29·738	29·723	29·810	29·788	29·701	29·772	29·749	29·802
5 "	30·184	29·628	29·931	29·690	29·911	29·740	29·724	29·812	29·791	29·700	29·772	29·744	29·802
6 "	30·188	29·628	29·937	29·698	29·917	29·742	29·727	29·818	29·799	29·703	29·773	29·741	29·806
7 "	30·192	29·632	29·942	29·702	29·920	29·744	29·733	29·824	29·805	29·712	29·779	29·742	29·811
8 "	30·201	29·638	29·947	29·705	29·923	29·744	29·734	29·827	29·811	29·718	29·790	29·747	29·815
9 "	30·210	29·643	29·950	29·707	29·922	29·744	29·734	29·829	29·816	29·718	29·796	29·752	29·818
10 "	30·220	29·648	29·950	29·708	29·919	29·743	29·733	29·830	29·817	29·718	29·804	29·760	29·821
11 "	30·221	29·651	29·951	29·703	29·914	29·740	29·731	29·828	29·814	29·716	29·805	29·759	29·819
Noon	30·214	29·646	29·949	29·700	29·910	29·736	29·727	29·823	29·809	29·710	29·798	29·751	29·814
1h. p.m.	30·203	29·637	29·941	29·695	29·902	29·730	29·725	29·819	29·804	29·704	29·788	29·744	29·808
2 "	30·195	29·629	29·929	29·690	29·897	29·725	29·723	29·813	29·802	29·696	29·781	29·738	29·802
3 "	30·193	29·626	29·922	29·683	29·889	29·721	29·720	29·807	29·798	29·692	29·783	29·739	29·798
4 "	30·196	29·623	29·916	29·683	29·885	29·718	29·717	29·802	29·798	29·692	29·784	29·743	29·796
5 "	30·200	29·625	29·916	29·686	29·885	29·718	29·715	29·800	29·798	29·695	29·788	29·748	29·798
6 "	30·202	29·632	29·923	29·693	29·889	29·723	29·717	29·802	29·805	29·703	29·791	29·753	29·803
7 "	30·207	29·636	29·931	29·703	29·897	29·727	29·721	29·808	29·812	29·704	29·795	29·756	29·808
8 "	30·207	29·635	29·934	29·718	29·909	29·734	29·726	29·820	29·815	29·706	29·797	29·758	29·813
9 "	30·208	29·635	29·934	29·725	29·918	29·744	29·734	29·825	29·814	29·708	29·800	29·761	29·817
10 "	30·210	29·631	29·932	29·729	29·922	29·748	29·738	29·830	29·813	29·706	29·799	29·765	29·819
11 "	30·214	29·631	29·931	29·733	29·922	29·748	29·737	29·832	29·809	29·704	29·798	29·768	29·819
Means	30·200	29·636	29·935	29·700	29·910	29·738	29·727	29·817	29·804	29·705	29·788	29·752	29·809
Number of Days employed.	31	29	31	30	31	30	31	31	30	31	30	31	..

MONTHLY MEAN TEMPERATURE of the AIR at every HOUR of the DAY, as deduced from the PHOTOGRAPHIC RECORDS.

Hour, Greenwich Mean Solar Time (Civil reckoning).	1880.												Yearly Means.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Midnight	32·3	40·4	40·8	43·6	46·5	52·8	57·4	58·5	55·8	44·6	41·5	42·2	46·4
1h. a.m.	32·1	40·1	40·6	43·2	45·8	52·3	56·7	57·9	55·5	44·2	41·3	42·1	46·0
2 "	31·9	40·0	40·3	43·0	45·5	52·0	56·3	57·4	55·3	43·8	41·1	42·1	45·7
3 "	31·9	40·0	40·1	42·8	45·0	51·7	55·9	57·3	55·2	43·6	41·1	42·1	45·6
4 "	31·8	39·9	39·8	42·3	44·8	51·4	55·7	57·3	55·2	43·4	41·1	42·0	45·4
5 "	31·7	40·0	39·6	42·1	45·3	51·9	56·0	57·3	55·1	43·4	41·1	42·0	45·5
6 "	31·5	39·8	39·7	42·7	46·7	53·1	57·1	58·0	55·2	43·3	41·0	42·1	45·9
7 "	31·8	39·7	40·2	44·1	49·3	55·1	58·7	59·3	56·3	43·8	40·8	42·2	46·8
8 "	31·6	39·7	41·8	46·4	52·3	57·4	61·0	61·1	58·6	44·8	41·1	42·3	48·2
9 "	31·9	40·3	44·0	48·2	54·6	59·0	63·1	63·4	61·3	46·3	42·2	43·0	49·8
10 "	33·0	41·8	46·5	49·4	56·6	60·4	64·6	64·9	63·2	48·2	43·6	44·1	51·4
11 "	34·2	43·6	48·6	51·2	58·6	61·8	66·2	66·4	64·5	49·5	44·9	45·0	52·9
Noon	35·6	44·9	50·0	52·4	59·9	62·9	67·7	67·9	65·7	50·4	46·1	45·5	54·1
1h. p.m.	36·2	46·1	50·7	52·5	60·8	63·9	68·3	69·2	66·6	51·1	46·5	45·6	54·8
2 "	36·5	46·6	51·2	53·0	61·1	64·1	68·6	70·0	66·5	51·3	46·1	45·5	55·0
3 "	36·2	46·3	50·8	52·8	60·9	64·2	67·8	70·5	66·0	50·9	45·4	45·1	54·7
4 "	35·4	45·6	49·8	52·1	60·2	63·9	67·4	69·5	65·0	49·5	44·2	44·5	53·9
5 "	34·6	44·3	48·0	51·6	58·3	62·7	66·7	68·4	63·4	48·3	43·4	44·1	52·8
6 "	34·2	43·3	45·9	50·0	56·7	60·7	65·0	66·4	61·5	47·2	42·8	43·7	51·4
7 "	33·7	42·5	44·0	48·3	54·5	59·0	63·1	64·2	59·6	46·2	42·6	43·2	50·1
8 "	33·3	42·0	42·8	47·0	51·8	57·0	60·9	62·1	58·2	45·8	42·3	42·9	48·8
9 "	32·8	41·5	41·9	45·8	49·8	55·3	59·3	60·8	57·2	45·2	42·1	42·7	47·9
10 "	32·3	41·4	41·4	44·8	48·6	54·6	58·4	59·9	56·5	44·8	42·0	42·5	47·3
11 "	31·9	41·0	41·3	43·9	47·6	53·9	57·7	59·2	55·8	44·5	41·7	42·1	46·7
Means	33·3	42·1	44·2	47·2	52·6	57·5	61·6	62·8	59·7	46·4	42·8	43·3	49·5
Number of Days employed.	31	29	31	30	31	30	31	31	30	31	30	31	..

MONTHLY MEAN TEMPERATURE of EVAPORATION at every HOUR of the DAY, as deduced from the PHOTOGRAPHIC RECORDS.

Hour, Greenwich Mean Solar Time (Civil reckoning).	1880.												Yearly Means.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
Midnight	31·3	39·5	39·9	42·2	44·3	51·7	56·1	57·4	55·1	43·7	40·2	40·9	45·2
1h. a.m.	31·3	39·2	39·8	41·9	43·9	51·3	55·7	57·0	55·0	43·5	40·0	40·9	45·0
2 ,,	31·2	39·1	39·5	41·8	43·7	51·2	55·4	56·6	54·8	43·1	39·8	40·8	44·8
3 ,,	31·1	39·2	39·4	41·8	43·4	51·0	55·1	56·5	54·7	42·9	39·9	40·9	44·7
4 ,,	31·0	39·0	39·1	41·3	43·2	50·7	54·9	56·6	54·8	42·8	40·0	40·8	44·5
5 ,,	30·9	39·0	38·9	41·3	43·6	51·0	55·2	56·5	54·6	42·8	39·9	40·9	44·6
6 ,,	30·7	38·9	38·8	41·8	44·6	51·8	56·0	57·0	54·6	42·8	39·7	41·0	44·8
7 ,,	31·0	38·9	39·3	42·7	46·3	53·2	57·0	57·8	55·3	43·1	39·6	41·1	45·4
8 ,,	30·9	38·8	40·4	44·2	47·9	54·6	58·2	59·1	56·8	44·0	39·8	41·2	46·3
9 ,,	31·1	39·3	42·1	45·1	49·0	55·6	59·0	60·2	58·2	45·1	40·6	41·8	47·3
10 ,,	31·9	40·3	43·5	45·8	50·1	56·5	59·8	61·1	59·1	46·3	41·6	42·6	48·2
11 ,,	32·7	41·6	44·4	46·8	51·0	56·9	60·5	61·9	59·7	47·2	42·4	43·3	49·0
Noon	33·8	42·5	45·3	47·4	51·6	57·4	61·4	62·6	60·2	47·8	43·2	43·4	49·7
1h. p.m.	34·2	43·2	45·5	47·2	52·1	57·7	61·5	63·3	60·6	48·3	43·3	43·5	50·0
2 ,,	34·5	43·5	45·6	47·5	52·2	57·6	61·5	63·5	60·7	48·2	42·8	43·5	50·1
3 ,,	34·3	43·2	45·6	47·5	52·1	57·8	61·6	63·8	60·5	47·9	42·3	43·2	50·0
4 ,,	33·8	42·8	44·9	46·9	51·7	57·4	61·0	63·2	59·9	47·0	41·5	42·7	49·4
5 ,,	33·2	41·8	43·9	46·5	50·9	56·5	60·6	62·7	59·0	46·4	41·0	42·4	48·7
6 ,,	33·0	41·4	42·7	45·5	49·8	55·7	59·7	61·7	58·2	45·7	40·9	42·0	48·0
7 ,,	32·6	41·0	41·8	44·7	48·8	55·0	58·9	60·8	57·4	45·1	40·8	41·7	47·4
8 ,,	32·3	40·5	41·1	44·0	47·3	53·9	57·9	59·6	56·7	44·6	40·5	41·5	46·7
9 ,,	31·8	40·2	40·5	43·4	46·3	53·1	57·0	58·8	55·9	44·2	40·4	41·2	46·1
10 ,,	31·4	40·1	40·3	42·7	45·7	52·8	56·6	58·4	55·5	43·9	40·4	41·0	45·7
11 ,,	31·0	39·8	40·2	42·2	45·1	52·4	56·2	57·9	55·0	43·6	40·3	40·7	45·4
Means	32·1	40·5	41·8	44·3	47·7	54·3	58·2	59·8	57·2	45·0	40·9	41·8	47·0
Number of Days employed.	31	29	31	30	31	30	31	31	30	31	30	31	..

MONTHLY MEAN TEMPERATURE of the DEW POINT at every HOUR of the DAY, as deduced by GLAISHER'S TABLES from the corresponding AIR and EVAPORATION TEMPERATURES.

Hour, Greenwich Mean Solar Time (Civil reckoning).	1880.												Yearly Means.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
Midnight	29·1	38·4	38·8	40·5	41·8	50·6	54·9	56·4	54·5	42·7	38·6	39·4	43·8
1h. a.m.	29·5	38·0	38·8	40·4	41·7	50·3	54·8	56·2	54·5	42·7	38·3	39·5	43·7
2 ,,	29·5	37·9	38·5	40·3	41·6	50·4	54·6	55·9	54·3	42·3	38·1	39·2	43·6
3 ,,	29·3	38·2	38·5	40·6	41·5	50·3	54·4	55·8	54·2	42·1	38·4	39·5	43·6
4 ,,	29·1	37·8	38·2	40·1	41·4	50·0	54·2	56·0	54·4	42·1	38·6	39·3	43·4
5 ,,	29·0	37·7	38·0	40·3	41·6	50·1	54·5	55·8	54·1	42·1	38·4	39·6	43·4
6 ,,	28·8	37·7	37·6	40·7	42·3	50·5	55·0	56·1	54·0	42·2	38·0	39·7	43·6
7 ,,	29·1	37·9	38·2	41·1	43·1	51·4	55·5	56·5	54·4	42·3	38·1	39·8	43·9
8 ,,	29·2	37·6	38·7	41·7	43·4	52·1	55·7	57·4	55·2	43·0	38·1	39·9	44·3
9 ,,	29·3	38·0	39·8	41·7	43·6	52·5	55·5	57·5	55·5	43·8	38·7	40·4	44·7
10 ,,	29·7	38·4	40·1	42·0	44·1	53·1	55·8	58·0	55·6	44·2	39·3	40·8	45·1
11 ,,	30·1	39·3	39·8	42·2	44·2	52·7	55·9	58·3	55·7	44·7	39·5	41·3	45·3
Noon	31·0	39·7	40·3	42·3	44·3	52·8	56·4	58·5	55·7	45·1	39·9	41·0	45·6
1h. p.m.	31·2	39·9	40·1	41·8	44·5	52·6	56·2	58·7	55·8	45·4	39·7	41·1	45·6
2 ,,	31·6	40·0	39·8	42·0	44·4	52·2	56·0	58·5	56·1	45·0	39·1	41·2	45·5
3 ,,	31·5	39·7	40·2	42·2	44·5	52·5	56·7	58·7	56·1	44·8	38·7	41·0	45·5
4 ,,	31·3	39·6	39·7	41·6	44·3	52·0	55·9	58·3	55·7	44·3	38·3	40·6	45·1
5 ,,	30·9	38·8	39·4	41·3	44·2	51·2	55·8	58·2	55·3	44·3	38·2	40·4	44·8
6 ,,	30·9	39·2	39·1	40·8	43·4	51·4	55·4	57·9	55·4	44·1	38·7	40·0	44·7
7 ,,	30·6	39·2	39·2	40·8	43·3	51·4	55·3	58·0	55·5	43·9	38·7	39·9	44·6
8 ,,	30·4	38·6	39·1	40·6	42·7	51·0	55·3	57·5	55·3	43·2	38·3	39·8	44·3
9 ,,	29·8	38·6	38·8	40·7	42·6	51·0	55·0	57·1	54·7	43·0	38·3	39·4	44·1
10 ,,	29·5	38·4	38·9	40·2	42·6	51·1	55·0	57·1	54·6	42·9	38·4	39·2	44·0
11 ,,	28·9	38·3	38·8	40·2	42·3	50·9	54·9	56·8	54·3	42·6	38·5	39·0	43·8
Means	30·0	38·6	39·1	41·1	43·1	51·4	55·4	57·3	55·0	43·4	38·6	40·0	44·4

MONTHLY MEAN DEGREE of HUMIDITY at every HOUR of the DAY, as deduced by GLAISHER'S TABLES from the corresponding AIR and EVAPORATION TEMPERATURES.

Hour, Greenwich Mean Solar Time (Civil reckoning).	1880. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly Means.
Midnight	87	92	93	[illegible]	85	93	91	93	95	93	90	90	91
1h. a.m.	90	92	94	90	87	93	93	94	96	94	90	91	92
2 ,,	91	93	94	90	87	94	94	95	97	94	90	90	92
3 ,,	90	94	94	92	88	95	94	95	97	94	91	91	93
4 ,,	89	93	94	92	88	95	95	95	97	95	91	91	93
5 ,,	89	92	94	94	87	94	94	95	97	95	91	91	93
6 ,,	89	93	93	93	85	91	92	93	96	96	90	91	92
7 ,,	89	94	93	89	79	88	89	91	93	94	90	91	90
8 ,,	90	93	90	83	72	82	83	88	88	94	90	91	87
9 ,,	90	92	85	79	66	80	77	81	82	92	88	90	84
10 ,,	88	88	78	76	63	77	74	79	77	87	85	88	80
11 ,,	85	85	71	72	59	73	70	76	74	84	82	87	76
Noon	84	82	70	69	56	70	67	71	70	82	80	85	74
1h. p.m.	82	80	67	67	55	67	65	69	69	81	78	85	72
2 ,,	82	79	65	67	55	65	64	67	70	79	77	86	71
3 ,,	83	79	67	67	55	65	67	66	71	80	78	86	72
4 ,,	85	80	68	68	56	65	66	67	73	83	79	87	73
5 ,,	86	81	72	68	59	67	68	70	75	87	82	87	75
6 ,,	88	85	77	71	61	71	72	75	81	90	85	86	78
7 ,,	89	88	83	75	66	76	76	80	87	92	86	88	82
8 ,,	89	89	87	79	72	80	82	85	90	91	86	89	85
9 ,,	89	90	89	83	76	86	86	88	91	92	87	88	87
10 ,,	89	90	91	84	82	88	88	91	93	93	88	88	89
11 ,,	88	90	91	86	83	[illegible]	90	92	94	93	89	89	90
Means	88	88	83	80	72	81	81	83	86	90	86	89	84

TOTAL AMOUNT of SUNSHINE registered in each HOUR of the DAY in each MONTH, as derived from the Records of CAMPBELL'S SELF-REGISTERING INSTRUMENT, for the YEAR 1880.

1880. Month.	Registered Duration of Sunshine in the Hour ending 5h. a.m.	6h. a.m.	7h. a.m.	8h. a.m.	9h. a.m.	10h. a.m.	11h. a.m.	Noon.	1h. p.m.	2h. p.m.	3h. p.m.	4h. p.m.	5h. p.m.	6h. p.m.	7h. p.m.	8h. p.m.	Total registered Duration of Sunshine in each Month.	Corresponding aggregate Period during which the Sun was above Horizon.	Mean Altitude of the Sun at Noon.
	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	
January ..	..	..	..	..	0·8	3·4	5·2	7·6	6·8	9·2	7·3	2·0	..	..	..	..	42·3	259·1	18
February .	..	..	..	0·3	2·9	5·6	6·8	8·7	8·1	8·7	8·1	3·2	0·2	..	..	..	52·6	288·7	26
March ...	..	..	0·5	3·2	8·4	[illegible]	13·6	[illegible]	16·4	17·5	18·5	15·9	13·6	4·5	..	..	141·0	366·9	37
April	..	0·6	6·6	10·4	11·7	11·0	11·7	14·0	12·5	11·8	11·7	11·5	11·7	7·1	0·2	..	132·5	414·9	48
May	..	2·8	8·4	10·6	14·3	13·9	16·6	18·4	17·3	17·5	17·6	17·0	15·0	15·0	7·8	..	192·8	482·1	57
June	0·2	3·5	5·8	7·1	8·2	9·0	9·6	11·5	12·9	12·6	13·9	14·3	11·1	8·9	3·5	0·4	132·5	494·5	62
July	..	1·7	7·9	11·4	12·4	13·9	16·2	15·9	18·2	18·1	14·4	12·9	12·2	11·9	2·1	..	169·2	496·8	60
August ..	..	0·1	2·9	4·9	5·8	7·0	7·9	9·6	11·5	11·2	12·6	12·0	11·9	8·3	0·6	..	106·3	449·1	52
September	..	..	1·0	7·6	9·8	11·8	11·2	10·9	14·0	15·3	13·1	12·1	9·5	3·0	..	..	119·3	376·9	41
October	..	..	..	0·6	3·9	6·2	7·8	6·9	7·7	7·1	7·5	3·5	1·1	..	..	..	52·3	328·7	30
November	..	..	..	..	0·5	5·1	7·7	10·1	10·9	10·3	7·9	1·8	..	..	..	..	54·3	264·4	20
December	..	..	..	..	..	1·6	5·0	5·6	4·7	1·8	0·5	..	..	..	..	..	19·2	242·7	16
						100.4	119.3	134.2	142.0	141.1	133.1								

AM 343.7
PM 416.2 } 72.5.

The hours are reckoned from apparent noon.

The total registered duration of sunshine during the year was 1214·3 hours; the corresponding aggregate period during which the Sun was above the horizon was 4464·8 hours; the mean proportion for the year (constant sunshine = 1) was therefore 0·272.

3 hours after noon clearer than 3 before noon.

See my charts. Scott says that all the Stations are going to be registered on like forms to mine. July 1882

(I.)—Reading of a Thermometer whose bulb is sunk to the depth of 25·6 feet (24 French feet) below the surface of the soil, at Noon on every Day of the Year.

1880.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	51·75	50·80	49·86	48·99	48·57	48·50	48·80	49·42	50·43	51·40	52·42	52·52
2	51·73	50·78	49·83	48·95	48·56	48·49	48·83	49·48	50·47	51·45	52·42	52·47
3	51·70	50·76	49·80	48·96	48·55	48·47	48·83	49·52	50·52	51·44	52·47	52·50
4	51·67	50·70	49·76	48·93	48·54	48·49	48·85	49·55	50·54	51·46	52·46	52·48
5	51·63	50·67	49·75	48·90	48·54	48·50	48·86	49·58	50·57	51·53	52·45	52·48
6	51·60	50·66	49·70	48·87	48·53	48·53	48·88	49·60	50·60	51·53	52·48	52·48
7	51·57	50·68	49·68	48·87	48·52	48·52	48·89	49·64	50·62	51·58	52·50	52·47
8	51·54	50·60	49·64	48·85	48·52	48·53	48·91	49·65	50·66	51·63	52·51	52·44
9	51·50	50·56	49·60	48·84	48·51	48·53	48·93	49·68	50·68	51·63	52·47	52·44
10	51·50	50·53	49·57	48·77	48·50	48·53	48·95	49·72	50·73	51·90	52·50	52·44
11	51·46	50·50	49·55	48·81	48·50	48·53	48·98	49·75	50·77	51·92	52·52	52·40
12	51·44	50·46	49·51	48·80	48·50	48·55	48·97	49·79	50·77	51·92	52·54	52·39
13	51·40	50·45	49·48	48·77	48·50	48·56	49·02	49·79	50·81	51·94	52·54	52·37
14	51·37	50·40	49·45	48·77	48·49	48·57	49·03	49·84	50·84	51·96	52·56	52·36
15	51·34	50·37	49·41	48·75	48·49	48·58	49·05	49·87	50·87	51·97	52·50	52·35
16	51·32	50·34	49·38	48·74	48·50	48·59	49·08	49·90	50·90	51·99	52·53	52·32
17	51·27	50·30	49·35	48·73	48·48	48·60	49·10	49·95	50·95	52·02	52·52	52·28
18	51·24	50·28	49·33	48·71	48·48	48·62	49·11	49·97	50·96	52·05	52·49	52·26
19	51·20	50·25	49·31	48·71	48·47	48·62	49·14	50·01	50·99	52·05	52·52	52·26
20	51·17	50·23	49·26	48·69	48·48	48·66	49·16	50·03	51·02	52·02	52·50	52·23
21	51·15	50·18	49·25	48·68	48·48	48·65	49·19	50·07	51·06	52·07	52·51	52·23
22	51·13	50·15	49·21	48·67	48·48	48·66	49·19	50·11	51·13	52·10	52·48	52·23
23	51·10	50·10	49·19	48·66	48·47	48·68	49·24	50·12	51·15	52·13	52·51	52·21
24	51·06	50·07	49·17	48·64	48·47	48·69	49·26	50·16	51·18	52·16	52·52	52·20
25	51·04	50·03	49·15	48·67	48·48	48·70	49·30	50·18	51·23	52·17	52·55	52·14
26	50·97	50·00	49·13	48·62	48·49	48·73	49·31	50·25	51·25	52·20	52·55	52·15
27	50·95	49·96	49·09	48·60	48·47	48·73	49·33	50·26	51·30	52·25	52·56	52·13
28	50·93	49·93	49·11	48·60	48·47	48·75	49·36	50·32	51·30	52·30	52·54	52·13
29	50·88	49·90	49·09	48·60	48·47	48·77	49·39	50·34	51·34	52·33	52·53	52·12
30	50·89		49·03	48·58	48·49	48·78	49·41	50·37	51·37	52·34	52·51	52·06
31	50·84		49·01		48·46		49·44	50·40		52·38		52·04
Means.	51·30	50·37	49·41	48·76	48·50	48·60	49·09	49·91	50·90	51·93	52·51	52·31

The mean of the twelve monthly values is 50°·30.

NOTE.—The indications of the thermometers I., II., III., and IV. on October 10 and on some following days appear to have been influenced in an unusual way by the heavy rains of October 9 and 10.

(II.)—Reading of a Thermometer whose bulb is sunk to the depth of 12·8 feet (12 French feet) below the surface of the soil, at Noon on every Day of the Year.

1880.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	48·47	46·40	45·10	45·90	46·70	48·49	50·70	53·44	55·44	56·45	55·07	52·16
2	48·36	46·38	45·10	45·90	46·78	48·57	50·78	53·53	55·51	56·46	54·94	52·00
3	48·25	46·30	45·11	45·98	46·80	48·64	50·85	53·64	55·58	56·38	54·89	51·98
4	48·16	46·20	45·11	45·98	46·85	48·72	50·92	53·78	55·66	56·32	54·76	51·88
5	48·09	46·12	45·14	45·97	46·89	48·82	51·10	53·87	55·65	56·44	54·64	51·85
6	47·99	46·09	45·15	45·98	46·95	48·94	51·13	53·91	55·70	56·33	54·59	51·78
7	47·90	46·02	45·18	46·01	46·99	49·00	51·21	54·00	55·70	56·39	54·51	51·70
8	47·81	45·91	45·17	46·01	47·07	49·09	51·33	54·02	55·77	56·38	54·40	51·58

(II.)—Reading of a Thermometer whose bulb is sunk to the depth of 12·8 feet (12 French feet) below the surface of the soil, at Noon on every Day of the Year—*concluded.*

1880.												
Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
9	47·75	45·84	45·20	46·06	47·10	49·18	51·42	54·11	55·79	56·37	54·35	51·57
10	47·72	45·77	45·22	46·07	47·13	49·25	51·52	54·20	55·92	56·61	54·28	51·48
11	47·65	45·70	45·23	46·08	47·20	49·31	51·63	54·29	55·94	56·61	54·10	51·38
12	47·60	45·61	45·27	46·13	47·26	49·39	51·73	54·37	55·97	56·55	54·00	51·33
13	47·53	45·56	45·30	46·16	47·29	49·49	51·82	54·40	56·00	56·45	53·90	51·27
14	47·55	45·50	45·31	46·18	47·34	49·53	51·92	54·42	56·03	56·39	53·79	51·21
15	47·45	45·48	45·33	46·19	47·39	49·58	52·00	54·49	56·10	56·35	53·57	51·19
16	47·40	45·40	45·40	46·23	47·41	49·63	52·10	54·52	56·20	56·26	53·53	51·09
17	47·38	45·33	45·41	46·24	47·45	49·70	52·18	54·60	56·28	56·20	53·40	51·02
18	47·30	45·33	45·48	46·24	47·50	49·79	52·24	54·64	56·28	56·17	53·25	50·96
19	47·21	45·28	45·53	46·29	47·54	49·83	52·33	54·70	56·30	56·06	53·18	50·93
20	47·17	45·26	45·52	46·30	47·61	49·89	52·42	54·73	56·39	55·90	53·04	50·89
21	47·11	45·20	45·59	46·32	47·69	49·99	52·48	54·83	56·44	55·90	53·00	50·80
22	47·10	45·16	45·61	46·37	47·71	50·00	52·57	54·87	56·53	55·88	52·84	50·80
23	47·02	45·10	45·68	46·38	47·78	50·12	52·70	54·90	56·53	55·81	52·82	50·73
24	46·97	45·09	45·70	46·40	47·86	50·17	52·77	54·97	56·53	55·78	52·78	50·66
25	46·90	45·08	45·74	46·42	47·93	50·22	52·88	54·99	56·57	55·70	52·72	50·57
26	46·81	45·07	45·79	46·48	48·04	50·29	52·92	55·10	56·58	55·60	52·68	50·50
27	46·77	45·08	45·79	46·50	48·09	50·36	53·03	55·12	56·58	55·60	52·58	50·48
28	46·70	45·09	45·80	46·55	48·15	50·47	53·10	55·25	56·48	55·50	52·48	50·47
29	46·63	45·09	45·87	46·60	48·22	50·57	53·19	55·29	56·49	55·36	52·36	50·39
30	46·58		45·89	46·67	48·32	50·63	53·26	55·31	56·47	55·23	52·24	50·26
31	46·52		45·91		48·38		53·36	55·39		55·20		50·18
Means .	47·41	45·57	45·44	46·22	47·47	49·59	52·05	54·51	56·11	56·08	53·62	51·13
The mean of the twelve monthly values is 50°·43.												

(III.)—Reading of a Thermometer whose bulb is sunk to the depth of 6·4 feet (6 French feet) below the surface of the soil, at Noon on every Day of the Year.

1880.												
Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°		°	°	°	°
1	44·18	43·08*	43·87	46·10	48·46	52·60	55·60	59·36	60·53	59·34	53·27	49·51
2	44·20	43·05*	43·90	46·10	48·49	52·70	55·80	59·39	60·52	59·35	53·07	49·46
3	44·29	43·03*	44·00	46·16	48·51	52·75	56·06	59·47	60·67	59·19	52·98	49·49
4	44·43	43·01*	44·10	46·19	48·59	52·80	56·26	59·50	60·78	59·09	52·69	49·43
5	44·58	43·00*	44·20	46·20	48·68	52·81	56·43	59·45	60·79	59·10	52·50	49·40
6	44·67	43·00*	44·32	46·30	48·79	52·87	56·55	59·35	60·88	58·80	52·29	49·35
7	44·73	43·01*	44·51	46·41	48·89	52·88	56·62	59·30	60·95	58·62	52·10	49·31
8	44·72	43·02*	44·70	46·50	48·97	52·87	56·72	59·30	61·09	58·39	51·86	49·27
9	44·72	43·04*	44·90	46·58	49·00	52·88	56·79	59·37	61·11	58·19	51·65	49·32
10	44·71	43·06*	45·07	46·60	49·06	52·91	56·84	59·43	61·19	57·00	51·57	49·34
11	44·66	43·08*	45·20	46·68	49·11	52·95	56·91	59·44	61·23	57·45	51·49	49·34
12	44·59	43·11*	45·33	46·71	49·17	52·98	56·97	59·39	61·31	57·50	51·39	49·40
13	44·50	43·14*	45·47	46·73	49·19	53·04	57·06	59·40	61·24	57·47	51·28	49·29
14	44·44	43·18*	45·56	46·76	49·27	53·12	57·13	59·43	61·23	57·36	51·22	49·37
15	44·32	43·22*	45·64	46·77	49·38	53·18	57·26	59·50	61·23	57·19	51·14	49·35

(III.)—Reading of a Thermometer whose bulb is sunk to the depth of 6·4 feet (6 French feet) below the surface of the soil, at Noon on every Day of the Year—*concluded*.

1880.												
Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
16	44·23	43·27*	45·78	46·84	49·52	53·30	57·40	59·57	61·20	57·10	51·19	49·29
17	44·16	43·32*	45·83	46·90	49·72	53·43	57·49	59·70	61·04	56·92	51·20	49·26
18	44·01	43·37*	45·90	46·92	49·97	53·58	57·63	59·77	60·77	56·78	51·17	49·21
19	43·93	43·42*	45·94	47·03	50·20	53·62	57·78	59·88	60·60	56·55	51·18	49·18
20	43·88	43·47*	45·95	47·12	50·50	53·70	57·94	59·90	60·59	56·30	50·99	49·10
21	43·78	43·52*	45·99	47·28	50·69	53·89	58·09	60·03	60·30	56·20	50·85	48·88
22	43·68	43·57*	46·00	47·46	50·79	54·01	58·19	60·06	60·18	56·00	50·63	48·75
23	43·60*	43·62*	46·04	47·64	50·95	54·28	58·40	60·09	59·92	55·77	50·49	48·49
24	43·52*	43·67*	46·09	47·82	51·15	54·48	58·50	60·17	59·72	55·30	50·26	48·31
25	43·44*	43·72	46·07	47·98	51·35	54·65	58·66	60·24	59·62	55·02	50·00	48·21
26	43·38*	43·80	46·03	48·09	51·56	54·79	58·70	60·33	59·55	54·75	49·80	48·18
27	43·32*	43·80	45·98	48·22	51·65	54·97	58·84	60·30	59·50	54·12	49·62	48·18
28	43·26*	43·80	46·00	48·32	51·82	55·14	58·91	60·39	59·37	53·82	49·55	48·08
29	43·20*	43·81	46·03	48·41	52·05	55·30	59·00	60·40	59·37	53·27	49·55	47·89
30	43·15*		46·07	48·43	52·31	55·44	59·09	60·38	59·38	53·27	49·50	47·70
31	43·12*		46·09		52·45		59·26	60·45		53·35		47·60
Means.	44·05	43·32	45·37	47·04	50·01	53·60	57·51	59·77	60·53	56·73	51·22	48·93
The mean of the twelve monthly values is 51°·51.												

The symbol * indicates that the reading was estimated in consequence of the fluid having gone out of range of the scale.

(IV.)—Reading of a Thermometer whose bulb is sunk to the depth of 3·2 feet (3 French feet) below the surface of the soil, at Noon on every Day of the Year.

1880.												
Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	40·30	36·90*	42·12	44·90	48·31	55·11	60·40	62·38	63·70	59·72	48·60	46·00
2	41·10	36·85*	42·48	44·83	48·59	54·71	60·70	62·11	63·76	59·50	48·34	46·03
3	41·74	36·85*	42·61	44·93	48·89	54·55	60·50	61·86	64·08	59·15	47·97	46·03
4	41·88	36·90	43·03	45·22	49·22	54·41	60·26	61·65	64·48	58·28	47·48	45·67
5	41·78	36·90	43·47	45·83	49·30	54·30	60·12	61·78	64·70	57·62	47·11	45·82
6	41·52	36·95	44·00	45·82	49·29	54·09	59·95	62·00	65·02	57·00	46·77	46·00
7	41·36	37·28	44·51	45·80	49·20	54·09	59·99	62·14	65·04	56·79	46·77	46·26
8	41·13	38·06	44·70	45·70	49·18	54·12	59·95	61·96	64·74	56·71	47·00	46·50
9	40·93	38·78	44·81	45·73	49·22	54·19	59·72	61·71	64·21	56·60	47·24	46·76
10	40·69	39·10	44·87	45·80	49·12	54·14	59·76	61·77	64·03	55·50	46·99	45·85
11	40·47	39·40	45·01	45·68	49·11	54·15	59·91	61·77	63·81	55·72	46·98	46·88
12	40·40	39·40	45·02	45·59	49·27	54·49	60·12	62·03	63·92	55·70	47·11	46·72
13	40·12	39·42	45·14	45·60	49·70	54·79	60·40	62·34	63·45	55·43	47·55	46·51
14	39·90	39·49	45·30	45·78	50·23	55·20	60·68	62·74	62·97	55·19	48·12	46·51
15	39·63	39·60	45·40	46·05	51·50	55·50	60·93	62·90	62·19	54·97	48·58	46·59
16	39·43	39·83	45·26	46·12	51·88	55·60	61·23	62·94	61·65	54·49	48·83	46·39
17	39·39	40·32	45·09	46·22	52·38	55·43	61·40	63·00	61·33	54·29	48·71	46·40
18	39·41	40·89	45·01	46·50	52·75	55·55	61·69	63·00	60·96	54·22	48·29	45·99
19	39·18	41·29	44·91	46·96	52·90	55·90	61·99	63·11	60·60	54·10	47·35	45·66
20	38·91	41·88	44·89	47·57	52·90	56·60	62·29	63·11	60·03	53·72	46·78	45·38

The symbol * indicates that the reading was estimated in consequence of the fluid having gone out of range of the scale.

(IV.)—Reading of a Thermometer whose bulb is sunk to the depth of 3·2 feet (3 French feet) below the surface of the soil, at Noon on every Day of the Year—*concluded.*

1880.												
Days of the Month	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
21	38·60	42·38	45·00	48·24	53·08	57·21	62·44	63·36	59·40	52·98	46·21	44·79
22	38·30	42·59	44·92	48·49	53·34	57·59	62·49	63·49	59·19	51·98	45·46	44·38
23	38·10	42·49	44·72	48·68	53·74	58·03	62·59	63·60	59·10	51·26	44·90	43·86
24	37·92	42·08	44·50	48·74	53·80	58·01	62·56	63·52	59·42	50·88	44·27	44·43
25	37·84	41·81	44·30	48·81	53·95	58·18	62·77	63·17	59·70	50·40	44·64	44·83
26	37·69	41·59	44·43	48·90	54·44	58·31	62·71	63·04	59·82	50·00	45·32	44·50
27	37·52	41·60	44·60	48·81	55·00	58·46	62·89	62·92	60·05	49·11	45·84	43·90
28	37·38	41·59	44·70	48·49	55·70	58·55	62·83	63·18	60·13	49·35	46·10	43·52
29	37·22	41·80	44·73	48·27	55·79	59·06	62·97	63·36	60·13	49·58	46·12	43·91
30	37·07		44·68	48·18	55·66	59·75	63·00	63·60	60·00	49·44	46·12	44·33
31	37·00		44·72		55·30		62·80	63·71		49·03		44·31
Means.	39·48	39·79	44·48	46·74	51·70	55·99	61·36	62·69	62·05	54·15	46·92	43·54
The mean of the twelve monthly values is 50°·91.												

(V.)—Reading of a Thermometer whose bulb is sunk to the depth of 1 inch below the surface of the soil, at Noon on every Day of the Year.

1880.												
Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	46·0	32·8	45·0	45·0	48·2	55·2	66·2	60·2	65·8	56·9	42·0	45·1
2	45·7	37·5	44·1	44·3	50·0	55·2	62·2	60·8	67·6	58·0	38·6	42·0
3	41·5	35·2	46·2	48·3	50·0	55·4	61·5	60·2	68·0	51·0	41·0	42·1
4	40·4	33·2	46·0	50·0	50·0	53·2	60·0	64·0	70·0	49·8	40·0	44·6
5	39·0	33·2	49·0	47·0	49·0	52·9	60·0	65·0	69·3	55·1	39·0	45·2
6	37·8	38·6	48·0	45·0	48·3	55·2	62·2	65·3	67·0	54·0	41·9	46·1
7	37·6	41·8	48·0	45·0	49·0	55·5	61·3	62·5	65·0	55·0	44·8	46·8
8	36·9	41·5	45·7	45·7	49·3	55·0	60·9	60·5	63·0	54·0	45·6	47·0
9	35·3	40·7	45·9	45·2	48·9	55·0	60·5	61·0	63·2	53·4	38·8	47·0
10	36·4	40·0	46·6	44·0	48·5	54·0	61·1	62·8	65·6	50·3	43·8	47·6
11	37·1	38·6	45·0	43·7	50·0	56·3	62·3	65·2	66·0	52·5	45·7	44·2
12	35·7	39·7	45·8	44·8	52·0	57·0	63·3	65·3	61·1	51·0	48·2	44·3
13	34·4	38·7	46·6	47·1	54·0	58·7	64·0	65·2	61·7	51·2	50·2	46·2
14	34·0	39·9	45·2	47·3	56·1	60·3	64·6	65·0	58·1	50·9	52·0	45·3
15	34·9	40·8	44·9	46·1	59·0	57·2	65·0	65·0	57·3	47·7	47·0	45·0
16	35·9	43·0	43·1	47·0	56·2	57·0	65·1	63·8	58·0	50·1	47·3	45·2
17	36·3	43·3	44·0	48·5	54·8	58·4	64·7	65·0	59·3	51·1	44·0	41·2
18	33·2	43·9	43·2	49·0	54·3	60·0	66·0	65·0	57·3	51·1	38·2	40·4
19	32·9	46·0	44·4	53·0	52·6	61·2	65·4	65·0	54·0	49·7	41·0	40·8
20	30·9	46·3	41·8	53·2	57·9	62·5	65·6	65·3	53·7	43·7	38·0	38·4
21	31·3	45·1	43·3	51·4	58·6	62·0	66·0	66·1	55·0	42·9	37·2	38·7
22	32·3	41·3	42·5	51·2	58·6	61·7	63·2	66·0	58·1	44·3	35·0	39·0
23	34·0	40·0	41·8	50·0	57·0	61·9	65·2	63·0	60·0	45·0	36·1	44·8
24	33·4	40·0	41·9	51·0	58·0	60·9	65·4	64·0	60·1	42·6	43·6	45·0
25	33·0	33·1	44·1	50·4	59·2	61·8	65·1	63·2	60·0	43·2	47·3	39·0

(V.)—Reading of a Thermometer whose bulb is sunk to the depth of 1 inch below the surface of the soil, at Noon on every Day of the Year—*concluded*.

1880.												
Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d				°	°	°	°		°	°	°	
26	31·3	42·0	45·8	48·0	63·3	60·9	65·0	65·0	60·9	44·1	48·6	37·1
27	30·7	40·3	43·0	46·4	64·0	61·2	65·0	64·5	61·3	46·0	46·0	40·8
28	30·8	44·0	42·0	47·2	58·2	63·2	65·1	66·0	59·2	49·2	44·0	45·0
29	30·6	43·0	42·8	47·8	56·8	65·1	65·2	66·4	58·5	44·0	45·2	46·1
30	34·0		45·0	48·2	56·8	66·0	61·7	66·2	57·8	41·0	43·3	41·9
31	33·2		46·8		55·6		60·0	65·4		41·9		37·6
Means.	35·4	40·3	44·8	47·7	54·3	58·7	63·5	64·1	61·4	49·1	43·1	43·2

The mean of the twelve monthly values is 50°·47.

(VI.)—Reading of a Thermometer within the case covering the deep-sunk Thermometers, whose bulb is placed on a level with their scales, at Noon on every Day of the Year.

1880.												
Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	52·4	34·7	50·2	49·2	55·3	57·2	70·9	60·0	75·5	57·3	42·3	47·5
2	49·3	40·4	50·3	46·0	58·8	57·8	65·4	61·9	78·4	61·6	43·6	39·8
3	45·9	42·7	51·6	58·8	54·7	56·5	64·1	65·9	78·8	51·0	45·4	46·7
4	42·0	33·3	51·6	54·6	52·5	53·8	61·3	73·4	84·6	46·8	44·6	48·9
5	41·4	37·6	58·0	50·5	47·1	56·2	66·8	74·6	75·9	65·3	37·9	49·0
6	35·3	44·8	50·6	44·7	49·7	58·8	66·5	70·4	72·8	52·0	47·3	50·6
7	36·6	47·2	52·7	53·2	51·7	61·5	63·5	65·0	68·9	60·0	50·1	50·0
8	36·3	43·0	46·0	52·0	55·0	57·9	67·8	62·0	67·0	55·1	47·3	48·7
9	32·0	46·0	53·0	46·0	53·0	57·8	66·5	66·5	65·0	58·0	40·1	49·9
10	37·3	42·0	53·7	44·2	50·0	61·8	67·3	73·9	76·2	54·2	48·3	54·6
11	35·5	41·2	52·0	44·0	55·8	61·0	69·3	76·3	71·3	54·6	51·3	40·0
12	36·2	46·0	50·3	50·0	59·2	63·3	71·0	72·8	65·3	51·8	53·6	48·1
13	31·9	45·4	54·1	55·8	60·0	67·1	71·1	70·6	62·5	53·7	56·5	51·4
14	30·1	43·1	46·0	48·2	68·9	68·0	72·0	67·8	57·9	50·8	55·2	43·2
15	33·9	44·1	45·9	47·3	72·7	56·6	71·0	67·3	56·8	48·0	43·7	50·9
16	37·8	47·2	43·3	54·9	63·0	59·6	72·8	65·2	59·6	52·4	49·0	47·0
17	35·8	45·6	48·3	59·9	58·9	63·0	68·9	70·4	63·8	53·0	43·1	38·5
18	31·2	49·2	50·3	59·0	58·3	71·8	71·6	68·0	55·8	55·0	34·5	38·6
19	30·2	50·0	51·2	65·6	55·5	66·9	70·6	70·6	51·1	48·0	39·8	41·0
20	26·2	51·8	38·2	57·8	68·2	67·5	72·5	67·0	57·2	35·5	38·4	37·9
21	28·4	50·3	49·3	58·6	70·6	69·1	71·3	72·9	57·6	43·2	37·7	38·3
22	32·0	40·2	42·2	56·9	61·4	61·9	70·9	68·4	67·7	45·0	31·7	45·5
23	36·0	39·1	43·3	56·0	60·7	70·5	74·2	63·0	64·1	44·6	38·0	51·5
24	33·2	38·9	51·4	57·4	63·2	68·0	70·9	68·7	63·8	44·6	48·0	48·2
25	31·8	42·9	56·6	54·2	69·4	70·0	73·8	64·6	66·3	45·6	54·0	36·5
26	30·0	47·8	57·3	46·9	81·2	64·2	68·2	69·9	68·5	43·0	55·3	36·7
27	26·7	45·2	42·1	47·2	67·8	69·9	71·2	66·6	70·0	52·1	51·6	46·8
28	27·3	51·1	41·2	48·5	62·5	70·7	66·2	75·2	60·3	51·0	51·0	52·1
29	27·3	50·0	49·3	52·3	60·4	74·6	69·5	74·0	60·0	41·1	48·8	49·9
30	48·0		54·8	54·0	65·1	74·3	64·6	70·8	60·0	39·8	44·0	40·3
31	37·5		54·9		53·0		63·0	72·1		47·3		35·0
Means.	35·3	44·2	49·7	52·5	60·1	63·9	68·9	68·9	66·1	50·4	45·7	45·3

The mean of the twelve monthly values is 54°·25.

ABSTRACT of the CHANGES of the DIRECTION of the WIND, as derived from the Records of OSLER'S ANEMOMETER.

1880, Month.	Direction of the Wind. At beginning of Month.	Direction of the Wind. At end of Month.	Apparent Motion.	Times of Shifts of the Recording Pencil.	Amount of Motion.	Monthly Excess of Motion. Direct.	Monthly Excess of Motion. Retrograde.
			°	d h m	°	°	°
January . .	W.S.W.	S.S.W.	− 45	6. 8.30	− 360		
				6. 22. 0	+ 360		
				7. 2.50	− 360		
				7. 22. 0	+ 360		
				10. 22. 0	+ 360	315	
				18. 8.20	+ 360		
				27. 9.40	+ 360		
				29. 9.15	− 360		
				31. 0.30	− 360		
February .	S.S.W.	S.W.	+ 22½	13. 21.10	− 360		
				22. 7.40	+ 360		337½
				22. 22. 0	− 360		
March . . .	S.W.	N.W.	+ 450	7. 10.45	− 360		
				9. 2. 0	+ 360		
				11. 2.45	− 360		
				11. 22. 0	− 360		
				12. 21. 0	+ 360		
				14. 0.10	+ 360		
				14. 22. 0	− 360		
				17. 0.10	− 360	450	
				20. 8.45	+ 360		
				22. 0.10	+ 360		
				22. 8.45	− 360		
				24. 0.10	− 360		
				27. 1.50	− 360		
				28. 0.30	+ 720		
				29. 9.50	+ 360		
April	N.W.	E.N.E.	− 247½	5. 2. 0	+ 360		
				7. 8.45	+ 360		
				7. 21.10	− 360		
				12. 8.50	+ 360		
				15. 22. 0	+ 360	472½	
				16. 22. 0	+ 360		
				21. 8.45	− 360		
				29. 10. 0	− 360		
May	E.N.E.	N.N.E.	− 45	6. 9. 0	+ 360		
				6. 22. 0	− 360		
				8. 22. 0	− 360		
				13. 9.10	+ 360		
				14. 8.45	− 360		
				15. 0.20	+ 360		
				18. 22. 0	+ 360		
				20. 9.10	+ 360	2835	
				20. 21.15	+ 360		
				21. 21.10	+ 360		
				25. 21.10	− 360		
				28. 0.15	+ 360		
May—*cont.*				29. 22. 0	+ 1080		
				30. 0.30	+ 360		
				30. 22. 0	− 360		
				31. 2. 0	+ 360		
June	N.N.E.	S.W.	− 157½	10. 0.10	− 360		
				10. 3. 0	− 360		
				10. 8.40	− 360		
				12. 9.55	+ 360		
				19. 8.45	− 360		
				19. 22. 0	+ 360	202½	
				21. 22. 0	+ 360		
				22. 8.15	+ 360		
				23. 2.50	+ 360		
				25. 8.45	− 360		
				26. 1.45	+ 360		
July	S.W.	S.S.W.	− 22½	5. 2.50	+ 360		
				13. 22. 0	+ 360		
				17. 0.20	− 360		
				17. 10. 0	+ 360	697½	
				20. 3. 0	− 360		
				20. 22. 0	+ 360		
				22. 8.45	− 360		
				28. 2.55	+ 360		
August . . .	S.S.W.	W.S.W.	+ 45	0. 22. 0	+ 360		
				1. 0.15	− 360		
				8. 8.30	− 360		
				16. 3. 0	− 360		1035
				20. 21.20	− 360		
				26. 21.10	+ 360		
				30. 3. 0	− 360		
September	W.S.W.	E.N.E.	− 180	4. 22. 0	+ 360		
				5. 22. 0	− 360		
				6. 9. 0	− 360		
				11. 1.50	+ 360		
				14. 21.20	− 360		540
				15. 22. 0	− 360		
				21. 22. 0	+ 360		
				24. 21. 0	+ 360		
				25. 22. 0	− 360		
October . .	E.N.E.	W.S.W.	+ 180	4. 21. 0	+ 360		
				5. 0. 0	+ 360		
				15. 0. 0	− 360		
				18. 0. 0	+ 360	900	
				26. 3. 0	− 360		
				27. 8.45	+ 360		

The sign + implies that the change in the direction of the wind has taken place in the order N., E., S., W., N., &c., or in *direct* motion; the sign − implies that the change has taken place in the order N., W., S., E., N., &c., or in *retrograde* motion.

The times of shifts of the recording pencil, as given above, refer to the shifts made by hand, when, by the turning of the vane, the trace tends to travel or has travelled out of range.

ABSTRACT of the CHANGES of the DIRECTION of the WIND, as derived from the Records of OSLER'S ANEMOMETER—*concluded.*

1880, Month.	Direction of the Wind. At beginning of Month.	Direction of the Wind. At end of Month.	Apparent Motion.	Times of Shifts of the Recording Pencil.	Amount of Motion.	Monthly Excess of Motion. Direct.	Monthly Excess of Motion. Retrograde.	1880, Month.	Direction of the Wind. At beginning of Month.	Direction of the Wind. At end of Month.	Apparent Motion.	Times of Shifts of the Recording Pencil.	Amount of Motion.	Monthly Excess of Motion. Direct.	Monthly Excess of Motion. Retrograde.
			°	d h m	°	°	°				°	d h m	°	°	°
November	W.S.W.	S.S.W.	− 45	3. 2. 45	− 360			Dec.—*cont.*				17. 21. 10	+ 360		
				10. 8. 45	+ 360		45					20. 0. 0	− 360		
				15. 8. 45	+ 360							27. 8. 30	+ 360	2925	
				18. 0. 0	− 360							27. 21. 15	+ 360		
												29. 0. 0	− 360		
December	S.S.W.	W.S.W.	+ 45	2. 21. 10	+ 360							29. 9. 30	+ 720		
				3. 0. 0	+ 360							29. 21. 0	+ 720		
				15. 0. 0	+ 360										

The sign + implies that the change in the direction of the wind has taken place in the order N., E., S., W., N., &c., or in *direct* motion; the sign − implies that the change has taken place in the order N., W., S., E., N., &c., or in *retrograde* motion.

The times of shifts of the recording pencil, as given above, refer to the shifts made by hand, when, by the turning of the vane, the trace tends to travel or has travelled out of range.

The whole excess of direct motion for the year was 6840°.

The revolution-counter which is attached to the vertical spindle of the vane, whose readings increase with change of direction of the wind in *direct* motion, and decrease with change of direction in *retrograde* motion, gave the following readings:—

	revs.
On 1879, December $31^{d}. 12^{h}$	16·2
On 1880, December $31^{d}. 12^{h}$	35·1

Implying an excess of direct motion, during the year, of 18·9 revolutions, or 6804°.

MEAN HOURLY MEASURES of the HORIZONTAL MOVEMENT of the AIR in each Month, and GREATEST and LEAST HOURLY MEASURES, as derived from the Records of ROBINSON'S ANEMOMETER.

Hour ending	1880. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Mean for the Year.
h	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.
1 a.m.	8·1	14·1	11·7	11·3	8·7	9·1	9·0	9·0	7·1	11·7	14·4	14·8	10·8
2 a.m.	7·9	13·7	12·3	11·8	8·5	9·3	9·0	8·5	7·2	10·1	14·3	14·5	10·6
3 a.m.	7·8	14·2	11·9	11·7	8·1	8·0	8·5	9·0	6·4	10·5	13·9	14·8	10·4
4 a.m.	7·9	14·3	11·5	11·5	8·7	7·8	8·7	9·2	6·5	9·4	13·4	14·6	10·3
5 a.m.	7·7	14·2	11·8	11·6	9·2	8·1	7·9	9·1	6·5	9·1	13·3	14·3	10·2
6 a.m.	7·2	14·0	11·3	10·9	9·3	7·9	8·1	8·8	6·7	9·3	14·2	13·5	10·1
7 a.m.	7·0	13·6	11·4	11·9	10·0	8·7	8·6	9·1	7·5	9·3	13·9	13·0	10·3
8 a.m.	7·1	13·7	11·8	13·4	11·5	9·1	9·9	9·7	8·1	9·2	13·8	12·9	10·8
9 a.m.	7·6	12·9	12·8	15·7	12·8	10·5	10·9	10·1	8·7	10·0	13·9	13·3	11·6
10 a.m.	7·3	13·5	14·7	16·8	14·0	11·3	11·6	10·6	9·6	10·6	13·8	14·1	12·3
11 a.m.	6·8	13·4	15·2	16·1	14·1	11·3	11·4	9·8	10·2	11·1	15·1	15·6	12·5
Noon.	7·2	14·3	15·8	17·0	14·3	12·5	12·9	10·4	11·0	12·6	15·2	16·6	13·3
1 p.m.	8·1	15·3	16·9	17·7	15·4	13·5	14·2	11·1	10·8	11·8	16·2	15·6	13·9
2 p.m.	7·8	16·0	16·0	17·7	15·7	13·6	14·1	11·2	10·7	13·3	17·4	16·1	14·1
3 p.m.	8·0	16·0	16·1	17·7	15·2	12·6	14·0	10·7	10·3	13·0	16·2	15·7	13·8
4 p.m.	7·8	15·6	16·0	16·2	15·5	13·8	13·7	10·6	10·3	13·7	15·5	14·9	13·6
5 p.m.	7·1	14·7	14·8	15·6	14·3	13·3	13·7	10·9	9·8	12·5	14·5	14·9	13·0
6 p.m.	6·8	14·2	14·0	15·4	13·5	12·6	12·9	11·2	8·4	12·7	15·3	14·6	12·6
7 p.m.	7·5	13·7	13·8	14·0	12·8	11·9	11·4	10·2	7·1	11·6	15·5	13·8	11·9
8 p.m.	7·8	14·5	13·5	12·9	11·6	10·3	9·9	9·4	7·2	11·5	14·9	14·8	11·5
9 p.m.	7·5	15·0	12·3	12·4	10·4	9·4	9·4	9·2	7·1	12·0	14·2	14·4	11·1
10 p.m.	7·0	14·9	11·7	11·6	9·2	9·3	9·1	8·9	7·3	11·1	14·2	14·6	10·7
11 p.m.	6·8	15·6	11·7	10·9	9·2	9·2	9·5	9·2	7·3	10·9	14·1	15·2	10·8
Midnight.	7·4	15·1	11·7	10·9	9·0	9·1	9·2	9·3	7·3	12·1	14·2	15·3	10·9
Means	7·5	14·4	13·4	13·9	11·7	10·5	10·7	9·8	8·3	11·2	14·6	14·7	11·7
Greatest Hourly Measures -	32	39	50	29	33	38	26	31	26	34	42	36	..
Least Hourly Measures -	0	0	0	1	0	0	1	0	0	0	0	1	..

MEAN ELECTRICAL POTENTIAL of the ATMOSPHERE, derived from THOMSON'S ELECTROMETER, for each CIVIL DAY, as deduced from TWENTY-FOUR HOURLY MEASURES of ORDINATES of the Photographic Register on that DAY.

(The scale employed is arbitrary; the zero reading is 10·000, and numbers greater than 10·000 indicate positive potential.)

1880.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d												
1	10·119	..	10·048	10·162	10·428	10·076	10·195	10·204	10·312	10·206	10·419	10·138
2	10·185	..	10·058	10·256	10·410	10·114	10·252	10·074	10·265	10·156	10·597	10·227
3	10·205	10·443	10·131	10·341	10·123	10·133	10·080	10·230	10·403	10·431	10·462	10·120
4	10·206	10·618	10·175	10·277	10·273	10·198	10·170	..	10·350	9·952	10·565	10·207
5	10·292	10·584	10·138	10·248	10·087	10·113	10·155	..	10·234	10·070	10·325	10·404
6	10·366	10·248	10·210	10·304	10·190	10·120	10·267	10·161	10·315	9·994	10·435	10·180
7	10·426	10·022	..	10·333	10·260	10·145	10·203	10·172	10·078	10·160	10·463	10·247
8	10·367	10·095	10·159	10·334	10·235	10·119	10·157	10·111	10·245	10·175	10·432	10·288
9	10·385	10·042	10·167	10·233	10·383	10·072	10·310	10·194	10·216	9·759	10·547	10·366
10	10·348	10·184	..	10·243	10·189	10·286	10·236	10·226	10·379	9·973	10·405	10·345
11	10·368	10·247	10·308	10·214	10·217	10·246	10·187	10·293	10·024	10·238	10·310	10·514
12	10·472	10·260	10·270	10·287	10·250	10·164	10·353	10·343	10·201	10·326	10·357	10·426
13	10·495	10·362	10·269	10·278	10·227	10·290	10·326	10·270	10·123	10·397	10·102	10·270
14	10·367	10·034	10·326	9·759	10·166	10·085	10·289	10·173	9·933	10·332	10·122	10·275
15	10·336	10·085	10·239	10·031	10·168	10·059	10·070	10·213	10·080	10·404	9·928	10·120
16	9·733	9·981	10·226	10·252	10·216	10·049	10·190	10·163	10·225	10·193	10·234	10·200
17	10·347	10·139	10·329	10·243	10·158	10·091	10·204	10·173	10·182	10·262	10·515	10·308
18	10·527	10·096	10·412	10·298	..	10·193	10·275	10·194	10·117	10·273	9·653	10·251
19	10·405	10·077	10·362	10·241	..	10·256	10·157	10·160	10·278	10·237	9·713	10·428
20	..	10·077	10·395	10·092	..	10·181	10·194	10·155	10·337	10·266	10·511	10·034
21	..	10·188	10·405	10·287	..	10·286	10·205	10·203	10·246	10·585	10·506	10·511
22	10·425	10·327	10·356	10·210	..	10·149	10·133	10·265	10·157	9·788	10·578	10·155
23	10·484	9·946	10·365	10·248	10·194	10·106	10·235	10·174	10·054	9·934	10·218	10·217
24	10·396	10·192	10·465	10·287	10·040	10·078	10·271	10·175	10·049	10·583	10·208	10·363
25	10·362	10·240	10·498	10·303	..	10·047	10·283	10·072	10·244	10·473	10·184	10·657
26	..	10·135	10·434	10·325	..	10·196	10·131	10·010	10·264	9·961	10·043	10·608
27	..	10·210	10·305	10·384	..	10·385	10·130	10·205	10·221	10·030	10·221	10·104
28	..	10·102	10·454	10·213	10·208	10·292	10·132	10·156	10·149	9·666	10·212	10·158
29	..	10·114	10·333	10·272	10·115	10·337	10·099	10·245	10·252	10·017	10·192	10·010
30	..		10·296	10·320	10·217	10·291	10·007	10·307	10·144	10·588	10·176	10·273
31	..		9·807		10·006		10·225	10·186		10·615		10·538
Means -	10·331	10·187	10·274	10·243	10·205	10·172	10·197	10·190	10·203	10·195	10·288	10·288

The mean of the twelve monthly values is 10·231.

MONTHLY MEAN ELECTRICAL POTENTIAL of the ATMOSPHERE, derived from THOMSON'S ELECTROMETER, at every HOUR of the DAY, as deduced from the PHOTOGRAPHIC RECORDS.

(The scale employed is arbitrary; the zero reading is 10·000, and numbers greater than 10·000 indicate positive potential.)

Hour, Greenwich Mean Solar Time (Civil reckoning).	1880.												Yearly Means.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
Midnight	10·330	10·217	10·275	10·312	10·243	10·248	10·262	10·252	10·280	10·182	10·296	10·321	10·268
1^h. a.m.	10·316	10·169	10·251	10·257	10·255	10·265	10·275	10·220	10·183	10·166	10·214	10·296	10·239
2 ,,	10·294	10·157	10·239	10·248	10·277	10·234	10·247	10·198	10·203	10·153	10·244	10·257	10·229
3 ,,	10·291	10·159	10·246	10·219	10·270	10·221	10·242	10·188	10·202	10·219	10·281	10·221	10·230
4 ,,	10·279	10·170	10·269	10·162	10·277	10·242	10·227	10·178	10·238	10·134	10·292	10·162	10·219
5 ,,	10·297	10·180	10·282	10·200	10·265	10·232	10·216	10·190	10·256	10·134	10·267	10·196	10·226
6 ,,	10·321	10·204	10·288	10·282	10·293	10·206	10·193	10·214	10·277	10·181	10·210	10·190	10·238
7 ,,	10·323	10·201	10·310	10·313	10·267	10·228	10·181	10·206	10·271	10·116	10·242	10·176	10·236
8 ,,	10·345	10·183	10·324	10·312	10·262	10·222	10·174	10·243	10·282	10·168	10·299	10·220	10·253
9 ,,	10·319	10·185	10·294	10·260	10·200	10·157	10·140	10·195	10·244	10·230	10·311	10·230	10·230
10 ,,	10·273	10·223	10·268	10·219	10·121	10·062	10·139	10·124	10·106	10·128	10·318	10·282	10·189
11 ,,	10·293	10·177	10·281	10·190	10·093	10·102	10·096	10·120	10·079	10·177	10·333	10·238	10·182
Noon	10·263	10·130	10·269	10·130	10·072	10·110	10·102	10·066	10·137	10·174	10·255	10·280	10·166
1^h. p.m.	10·316	10·149	10·263	10·159	10·011	10·081	10·155	10·110	10·122	10·152	10·309	10·288	10·176
2 ,,	10·365	10·163	10·203	10·150	10·097	10·073	10·108	10·134	10·094	10·170	10·332	10·244	10·178
3 ,,	10·308	10·173	10·213	10·082	10·086	10·046	10·062	10·099	10·129	10·208	10·120	10·258	10·149
4 ,,	10·328	10·164	10·228	10·134	10·085	10·086	10·138	10·127	10·158	10·191	10·266	10·350	10·188
5 ,,	10·378	10·179	10·236	10·239	10·152	10·060	10·179	10·083	10·178	10·225	10·233	10·367	10·209
6 ,,	10·406	10·210	10·272	10·265	10·242	10·130	10·192	10·156	10·183	10·260	10·277	10·390	10·249
7 ,,	10·385	10·196	10·291	10·311	10·271	10·116	10·187	10·247	10·226	10·310	10·375	10·400	10·276
8 ,,	10·366	10·228	10·322	10·313	10·287	10·182	10·305	10·295	10·262	10·293	10·320	10·381	10·296
9 ,,	10·409	10·204	10·308	10·332	10·273	10·260	10·299	10·315	10·302	10·326	10·329	10·372	10·311
10 ,,	10·375	10·246	10·334	10·367	10·270	10·262	10·318	10·308	10·288	10·237	10·383	10·411	10·317
11 ,,	10·369	10·219	10·304	10·364	10·258	10·301	10·299	10·291	10·162	10·145	10·400	10·390	10·292
Means -	10·331	10·187	10·274	10·243	10·205	10·172	10·197	10·190	10·203	10·195	10·288	10·288	10·231
Number of Days employed -	23	27	29	30	23	30	31	29	30	31	30	31	..

AMOUNT OF RAIN COLLECTED IN EACH MONTH OF THE YEAR 1880.

1880, MONTH.	Number of Rainy Days.	Monthly Amount of Rain collected in each Gauge.							
		Self-registering Gauge of Osler's Anemometer.	Second Gauge at Osler's Anemometer.	On the Roof of the Octagon Room.	On the Roof of the Magnetic Observatory.	On the Roof of the Photographic Thermometer Shed.	Crosley's.	Gauge partly sunk in the Ground, read daily.	Gauge partly sunk in the Ground, read monthly.
		in.	in.	in.	in.	in.	in.	in.	in.
January	9	0·056	0·054	0·192	0·197	0·230	0·270	0·261	0·263
February	18	0·928	0·923	1·702	2·035	2·259	2·260	2·357	2·250
March	4	0·081	0·123	0·313	0·423	0·512	0·495	0·595	0·463
April	16	0·957	1·044	1·779	1·943	2·165	2·175	2·205	2·040
May	4	0·309	0·333	0·415	0·452	0·496	0·600	0·497	0·330
June	20	1·405	1·528	1·797	2·151	2·232	2·690	2·257	2·100
July	24	2·762	2·824	3·282	3·549	3·686	4·130	3·812	3·691
August	6	0·665	0·732	0·822	0·946	0·980	1·115	0·978	0·836
September	12	2·858	2·968	3·417	3·750	3·959	4·355	4·002	3·825
October	18	4·877	5·352	5·850	7·044	7·715	8·290	7·653	7·654
November	14	1·021	1·075	1·373	1·655	1·998	2·105	2·060	1·965
December	15	1·778	1·992	2·386	2·558	2·855	3·020	3·005	2·885
Sums	160	17·697	18·948	23·328	26·703	29·087	31·505	29·682	28·302

The heights of the receiving surfaces are as follows:

	Above the Mean Level of the Sea. Ft.	In.	Above the Ground. Ft.	In.
The Two Gauges at Osler's Anemometer	205	6	50	8
Gauge on the Roof of the Octagon Room	193	2	38	4
Gauge on the Roof of the Magnetic Observatory	176	7	21	9
Gauge on the Roof of the Photographic Thermometer Shed	164	10	10	0
Crosley's Gauge	156	6	1	8
The Two Gauges partly sunk in the Ground	155	3	0	5

Until May 22 the two Osler gauges were greatly overshadowed by a scaffold erected round the vane of Osler's Anemometer during alterations and repairs of the wind-pressure apparatus.

ROYAL OBSERVATORY, GREENWICH.

OBSERVATIONS

OF

LUMINOUS METEORS.

1880.

Month and Day. 1880.		Greenwich Mean Solar Time.	Observer.	Apparent Size of Meteor in Star-Magnitudes.	Colour of Meteor.	Duration of Meteor in Seconds of Time.	Appearance and Duration of Train.	Length of Meteor's Path in Degrees.	No. for Reference.
		h m s				s		°	
January	2	7.40. ±	H.	> 1	White	1	None	40	1
	..	7.50. ±	H.	> 1	White	0·5	None	20	2
	..	8.24.24	H.	2	White	0·5	None	30	3
	..	8.31.44	H.	1	Bluish-white	2	Train	40	4
	..	9.30.14	H.	> 1	White	2	Fine	40	5
	..	9.42.44	H.	1	Bluish-white	0·5	Train	10	6
	..	9.52.24	H.	2	Bluish-white	1	None	40	7
	..	9.57.54	H.	1	Bluish-white	0·5	None	20	8
	..	10. 1.29	H.	2	Bluish-white	0·2	None	10	9
	..	10. 6.24	H	1	Bluish-white	0·5	Slight	20	10
	..	10. 7.44	H.	2	Bluish-white	0·2	None	10	11
February	10	8.50.53	S.	2	Bluish-white	0·8	None	12	12
March	29	7.55.	S.	2 increasing to Sirius × 2.	Blue	2·5	Very fine	..	13
April	30	9.49.43	C.	2	White	0·4	None	5	14
	..	10. 1.24	S.	1	Blue	0·8	Slight	12	15
	..	10.14.37	S.	2	Blue	0·8	None	..	16
	..	10.27. 6	S.	3	Bluish-white	0·5	None	10	17
July	29	11.25.	E.	> 1	White	0·5	Train	12	18
August	9	9.49.33	H.	2	Bluish-white	0·2	. . .	10	19
	..	10. 0.23	H.	1	Bluish-white	0·5	Slight	20	20
	..	10.10.28	H., M.	> Jupiter	Yellow	0·5	Splendid	15	21
	..	10.14.21	H., M.	1	Bluish-white	1	Slight	..	22
	..	10.23. 3	M.	2	Yellow	0·5	. . .	20	23
	..	10.24.23	H.	1	Bluish-white	1	Fine	25	24
	..	10.26.23	H.	> 1	Bluish-white	1	Very fine	30	25
	..	10.32. 8	H.	1	Bluish-white	0·5	Slight	20	26
	..	10.32.18	H.	> 1	Bluish-white	1·5	Fine	30	27
	..	10.32.48	M.	1	Yellow	0·3	. . .	20	28
	..	10.40.11	M.	2	Bluish-white	0·2	. . .	10	29
	..	10.42.28	H.	> 1	Bluish-white	1	Fine	25	30
	..	10.43.28	H.	Saturn	Bluish-white	1	Fine	30	31
	..	10.52.28	M.	2	Bluish-white	0·2	. . .	10	32
	..	11. 2. 3	H.	1	Bluish-white	0·1	. . .	2	33
	..	11. 2.48	M.	2	Yellow	0·4	Slight	15	34
	..	11.11.48	H.	1	Bluish-white	0·3	Slight	..	35
	..	11.19.13	H.	3	White	0·2	. . .	..	36
	..	11.21.53	H.	1	Bluish-white	0·5	Slight	12	37
	..	11.22. 4	H.	1	Bluish-white	..	Slight	15	38
	..	11.22.18	H.	1	Bluish-white	1	Fine	30	39
	..	11.39.28	H.	1	Bluish-white	0·2	. . .	..	40
	..	11.41.53	H.	1	Bluish-white	0·5	Slight	..	41
	..	11.47.38	H., M.	Saturn	Yellow	2	Fine	25	42
	..	11.50.48	H.	2	Bluish-white	..	. . .	5	43
	..	11.55.23	M.	2	Bluish-white	0·5	Slight	10	44
	..	11.55.53	H.	1	Bluish-white	..	Train	10	45
	..	11.58.58	H.	Increased from 2 to Saturn × 2	Yellow	0·5	Slight	5	46
	..	12.10.23	H.	1	Bluish-white	0·5	Fine	15	47
	..	12.11.28	M.	Saturn	Yellow	1	Fine	15	48
	..	12.15.33	H.	1	White	0·3	Train	20	49
	..	12.23.	E.	Jupiter	Bluish-white	1	Train	15	50
	..	12.27. 3	H.	1	Bluish-white	0·2	Train	25	51
	..	12.31.43	H.	1 decreasing to 3	Yellow	2	. . .	40	52
	..	12.42.18	H.	> 1	Yellow	2	None	..	53
	..	12.44.28	M.	1	Yellow	0·8	Slight	10	54
	..	12.46.58	H.	1	White	0·5	Train	20	55
	..	12.52.58	M.	1	Bluish-white	0·5	None	20	56
	..	12.53.18	H.	1	Yellow	0·5	. . .	15	57
	..	12.58.53	H.	2	Blue	0·2	. . .	10	58

August 7 and 8. Sky cloudy.

No. for Reference.	Path of Meteor through the Stars.
1	From direction of η Draconis across α Cygni.
2	From η Draconis across β Ursæ Minoris.
3	From direction of α Persei passed about 2° to right of the Pleiades.
4	Moved from direction of ζ Draconis and passed across ζ Cephei.
5	Shot from direction of a point about 2° below Polaris and passed across γ Cassiopeiæ.
6	From a point 2° to right of η Draconis towards ϕ Draconis.
7	Moved from a point about 5° below β Tauri across Aldebaran.
8	From α Orionis towards κ Orionis.
9	From direction of Polaris towards ϵ Cassiopeiæ.
10	Moved from direction of Aldebaran towards γ Eridani.
11	Shot from Aldebaran towards γ Eridani.
12	From between β and θ Aurigæ towards a point about 5° below Capella.
13	From direction of ϵ Ursæ Majoris disappeared near θ Leonis.
14	From β Boötis towards ϵ Boötis.
15	From direction of β Leonis across χ Leonis.
16	From about 2° above Arcturus towards a point about 8° above β Leonis.
17	From about 3° to left of and a little above ϵ Virginis towards δ Virginis.
18	From direction of α Pegasi passed midway between β and η Pegasi.
19	Appeared near β Pegasi and moved towards ι Pegasi.
20	From direction of α Persei shot across β Camelopardali towards β Ursæ Majoris.
21	Shot from β Andromedæ towards γ Pegasi.
22	From α Pegasi described a path curved towards zenith through γ Aquarii.
23	Shot from direction of ζ Aquarii to δ Capricorni.
24	Appeared near a point about 5° below ϵ Cassiopeiæ and moved towards Polaris.
25	From direction of α Cassiopeiæ shot towards α Pegasi.
26	From direction of and near γ Andromedæ towards Jupiter.
27	From direction of and near γ Andromedæ towards Jupiter.
28	Shot from direction of a point 10° above β Andromedæ, passed midway between α and ζ Pegasi.
29	From direction of α Persei disappeared a few degrees beyond β Trianguli.
30	Moved from a point a few degrees to left of δ Cassiopeiæ towards α Cephei.
31	Shot from α Arietis towards and to about 2° from Jupiter.
32	From direction of β Cassiopeiæ shot towards γ Andromedæ.
33	From direction of α Persei to a point 5° above Capella.
34	From direction of Polaris towards β Ursæ Minoris.
35	From ζ Persei towards the Pleiades.
36	From a point 10° to right of Polaris shot downwards.
37	Shot from ν Persei to ζ Persei.
38	From β Persei moved towards 41 Arietis.
39	From ϵ Cassiopeiæ towards Polaris.
40	Appeared as a flash of light 2° above α Persei.
41	From δ Ursæ Majoris towards a point a few degrees above θ Ursæ Majoris.
42	Appeared close to α Cassiopeiæ and moved towards α Andromedæ.
43	From direction of a point about 2° above α Persei shot across α Camelopardali.
44	From direction of γ Andromedæ passed between β and δ Persei.
45	From direction of a point about 2° above α Persei shot across α Camelopardali.
46	Moved from a point 1° below α Persei across ψ Persei.
47	Passed about 1° above β Trianguli, moving from direction of ι Persei.
48	From direction of β Ursæ Minoris moved towards η Ursæ Majoris.
49	From near ι Andromedæ passed between β and η Pegasi.
50	From near β Cygni passed in direction of α Ophiuchi.
51	From γ Draconis across π Herculis.
52	From a point 5° to right of β Lyræ passed 1° to right of α Lyræ.
53	From near Capella passed about 4° to right of β Aurigæ towards horizon.
54	From direction of α Arietis moved towards and disappeared near Jupiter.
55	Appeared about 2° below ϵ Cassiopeiæ and disappeared near γ Cephei.
56	From direction of β Cassiopeiæ disappeared near α Andromedæ.
57	From a point about 1° to left of Capella shot past β Aurigæ.
58	From α Andromedæ towards α Pegasi.

Month and Day, 1880.		Greenwich Mean Solar Time.	Observer.	Apparent Size of Meteor in Star-Magnitudes.	Colour of Meteor.	Duration of Meteor in Seconds of Time.	Appearance and Duration of Train.	Length of Meteor's Path in Degrees.	No. for Reference.
		h m s							
August	9	13. 0.33	M.	1	Blue	..	Fine	15	1
	,,	13. 5.13	H.	2	Bluish-white	0·2	..	5	2
	,,	13.18.43	H.	2	Bluish-white	..	None	5	3
	,,	13.20.28	M.	Saturn	Yellow	1	Fine	30	4
	,,	13.21.38	H.	1	Bluish-white	1	..	20	5
	,,	13.22.53	H.	2	Bluish-white	0·5	Slight	15	6
	,,	13.25.38	H.	1	Bluish-white	1	Fine	20	7
	,,	13.29. 8	M.	2	Bluish-white	0·5	None	3	8
	,,	13.29.48	H.	1	Bluish-white	0·5	Slight	15	9
	,,	13.34.48	H.	2	Yellow	0·2	..	10	10
	,,	13.41.28	H.	2	White	..	Slight	10	11
August	10	9.38.52	M.	1	Bluish-white	1	Fine	20	12
	,,	9.50.42	M.	Jupiter	Bluish-white	2·5	Fine	25	13
	,,	10. 2.27	M.	2	Yellow	1	Slight	15	14
	,,	10.15.52	M.	1	Bluish-white	0·7	..	10	15
	,,	10.23.52	N.	1	Bluish-white	..	Train	..	16
	,,	10.26.45	N.	1	Bluish-white	..	Train	15	17
	,,	10.31.30	N.	> 1	Bluish-white	..	Fine	25	18
	,,	10.36.47	N.	Jupiter	Bluish-white	0·8	Fine	12	19
	,,	10.40. 3	N.	1	Bluish-white	0·5	None	5	20
	,,	10.40.47	N.	..	Bluish-white	0·4	Train	4	21
	,,	10.51. 7	N.	2	Bluish-white	0·7	..	8	22
	,,	10.56.32	M.	Jupiter	Bluish-white	1·5	Fine	10	23
	,,	10.58.49	N.	1	Bluish-white	0·5	Train	8	24
	,,	11. 0.17	N.	Jupiter	White	0·9	Fine	12	25
	,,	11. 3.57	N.	2	Bluish-white	1	Train	18	26
	,,	11.11. 2	N.	4	White	0·5	None	5	27
	,,	11.22.52	M.	Saturn	Bluish-white	1·5	None	20	28
	,,	11.23.47	N.	1	Bluish-white	0·7	Train	10	29
	,,	11.26.57	N.	1	Bluish-white	0·5	Train	12	30
	,,	12.10.35	N.	3	Bluish-white	..	Fine	..	31
	,,	12.17.42	N.	Jupiter	Bluish-white	1	Fine	15	32
	,,	12.17.57	N.	2	Bluish-white	..	..	10	33
	,,	12.30.17	N.	> 1	Bluish-white	0·7	Fine	..	34
	,,	12.31.30	N.	> 1	Bluish-white	0·8	Fine	12	35
	,,	12.37.20	N.	2	White	..	Train	..	36
	,,	12.42.17	N.	1	Bluish-white	..	Train	12	37
	,,	12.46.28	N.	1	Bluish-white	..	Train	10	38
	,,	12.47.17	N.	1	Bluish-white	..	Fine	10	39
	,,	12.54.12	N.	2	Bluish-white	..	Train	8	40
	,,	13.18.48	N.	1	White	0·7	Fine	10	41
	,,	13.22.44	N.	2	White	0·3	Slight	4	42
	,,	13.37.42	N.	3	Bluish-white	0·5	Slight	..	43
	,,	13.39.52	N.	Jupiter	Bluish-white	1	Fine	..	44
	,,	13.47.54	N.	1	Bluish-white	0·5	Train	..	45
	,,	13.51.22	N.	1	Bluish-white	0·7	Train	..	46
	,,	13.56.37	N.	Jupiter	Bluish-white	0·7	Fine	10	47
August	11	11.22.53	M.	1	Bluish-white	1	Slight	15	48
	,,	11.33.53	E.	2	. . .	0·5	Slight	15	49
	,,	11.43.23	M.	2	Bluish-white	0·7	Slight	10	50
	,,	11.51.43	E.	3	Bluish-white	0·5	None	10	51
	,,	11.57.43	M.	2	Bluish-white	0·5	Train	8	52
	,,	12. 7.23	E.	1	Bluish-white	0·5	Slight	10	53
	,,	12. 9. 3	M.	1	Bluish-white	0·5	Fine	10+	54
	,,	12.10.43	M.	Saturn	Bluish-white	1	Fine	15	55
	,,	12.26.43	M.	> Saturn	Bluish-white	0·8	Slight	20	56
	,,	12.37.43	M.	2	Bluish-white	0·7	None	..	57
	,,	12.42.28	E.	1	Bluish-white	1	Train	5	58
	,,	12.51. 3	E.	2	Bluish-white	0·3	..	8	59
	,,	12.54.53	M.	1	Bluish-white	1·5	Fine	20	60
	,,	13. 2. 4	W. J. S.	2	. . .	..	..	..	61
	,,	13. 8.43	W. J. S.	3	Bluish-white	0·3	..	..	62

August 10. Sky quite cloudy after 14^h.
August 11. The observations were much interrupted at times by cloud; entirely cloudy after $13\frac{1}{2}^h$.

No. for Reference.	Path of Meteor through the Stars.
1	From direction of β Ursæ Minoris disappeared near ι Draconis.
2	From direction of Polaris passed across η Ursæ Minoris.
3	From α Persei across δ Persei.
4	From direction of α Persei disappeared near Saturn.
5	From near β Persei moved towards Capella.
6	From direction of α Persei across α Camelopardali.
7	Passed from a few degrees below the Pleiades and disappeared about 4° to left of ξ Tauri.
8	From direction of γ Cassiopeiæ passed midway between δ and ϵ Cassiopeiæ.
9	From direction of λ Andromedæ passed between β and η Pegasi.
10	From a point about 3° below Capella towards a point between θ Aurigæ and β Tauri.
11	From direction of a point about 4° above β Persei towards Saturn.
12	From direction of a point a few degrees below ϵ Cassiopeiæ moved towards and disappeared near α Andromedæ.
13	Shot from direction of ϵ Cassiopeiæ and disappeared a few degrees below β Ursæ Majoris.
14	From direction of γ Andromedæ passed between α Andromedæ and γ Pegasi.
15	From direction of α Persei disappeared near β Trianguli.
16	Passed between ϵ Pegasi and α Aquarii moving from direction of a point about 3° above α Pegasi.
17	Passed between θ Pegasi and α Aquarii and a little above β Aquarii.
18	From a point a few degrees from η Pegasi to a point 2° above θ Aquilæ.
19	Disappeared 2° above γ Boötis moving from direction of γ Ursæ Minoris.
20	Passed across Polaris, moving from direction of γ Cephei.
21	Moving from γ Cassiopeiæ across ψ Cassiopeiæ (thin cloud in north).
22	Passed across α and ζ Pegasi.
23	Moved from direction of α Pegasi and disappeared 2° below δ Aquarii.
24	Passed 5° below γ Pegasi at right angles to a line joining that star and β Pegasi, moving from direction of a point midway between [Trianguli and γ Andromedæ.
25	From η Aquarii passed across δ Capricorni.
26	From ι Pegasi passed between Delphinus and Equuleus.
27	Passed midway between α and τ Ursæ Majoris, moving from direction of δ Ursæ Minoris.
28	Passed midway between α and ζ Pegasi, moving at right angles to a line joining those stars, and passing near to γ Piscium.
29	Passed across ζ Cygni and β Delphini.
30	Moved from direction of a point midway between γ Ursæ Minoris and η Draconis to a point 4° to left of η Ursæ Majoris (very [cloudy.)
31	Passed about 3° to right of β Ursæ Minoris, moving towards δ Ursæ Majoris.
32	Passed across γ Aquarii and δ Capricorni.
33	From direction of a point midway between γ and β Andromedæ disappeared near γ Pegasi.
34	Passed across α and δ Aquilæ.
35	Passed about 1° to left of γ and β Cygni.
36	From direction of β Camelopardali passed between α and δ Persei.
37	Passed across γ Pegasi and γ Piscium.
38	Passed across ω Piscium, moving from direction of β Andromedæ.
39	Passed between ϵ and ζ Ursæ Majoris, moving from direction of κ Draconis.
40	Passed between κ and α Draconis towards ϵ Ursæ Majoris.
41	Passed midway between γ and ϵ Cygni and across β Cygni.
42	Passed about 2° to left of Capella towards θ Aurigæ.
43	Passed between β and η Pegasi to ι Pegasi.
44	Passed 2° or 3° to right of α and ζ Pegasi to θ Pegasi.
45	Moving from direction of β Persei to Aldebaran.
46	Passed a few degrees to left of α Pegasi and across γ Aquarii.
47	Passed midway between Saturn and Aldebaran, moving from direction of ϵ Arietis.
48	From direction of γ Andromedæ passed between γ Pegasi and Jupiter.
49	Passed 6° above β Andromedæ and a little above α Andromedæ.
50	From a point 5° above γ Ursæ Minoris passed between ι Draconis and η Ursæ Minoris.
51	From direction of β Pegasi passed across ϵ Pegasi.
52	Passed across ζ Pegasi and midway between α Aquarii and ϵ Pegasi.
53	Passed across ι Cephei and in direction of α Cygni.
54	From 2° above α Pegasi passed across γ Aquarii.
55	From direction of θ Pegasi passed 3° above γ Capricorni.
56	From β Ursæ Minoris passed between ζ and ϵ Ursæ Majoris.
57	From a point 4° below Polaris passed across ζ Draconis.
58	From direction of δ Cassiopeiæ towards β Persei.
59	Passed across β Trianguli and nearly midway between 41 Arietis and α Arietis.
60	From ϵ Cassiopeiæ passed between β and γ Andromedæ.
61	From a little below γ Aurigæ moved directly downwards.
62	Passed a few degrees to right of δ Ursæ Majoris and a very little to right of γ Ursæ Majoris, moving downwards.

Month and Day, 1880.		Greenwich Mean Solar Time.	Observer.	Apparent Size of Meteor in Star-Magnitudes.	Colour of Meteor.	Duration of Meteor in Seconds of Time.	Appearance and Duration of Train.	Length of Meteor's Path in Degrees.	No. for Reference.
		h m s				s		°	
August	11	13. 9. 43	E.	2	Bluish-white	0·3	. . .	10	1
	"	13. 12. 38	E.	2	Bluish-white	0·3	. . .	. .	2
	"	13. 14. 49	M.	2	Bluish-white	0·8	Slight	15	3
	"	13. 26. 58	E.	1	Red	. .	. . .	7	4
August	12	8. 16. 45 ±	E. W. M.	Venus × 2	Slight tinge of Green	. .	Train	. .	5
November	19	10. 20.	N.	Jupiter	Yellowish	. .	Train	. .	6
November	21	8. 10.	N.	1	White	0·7	Train	. .	7
November	25	10. 35.	N.	1	Bluish-white	. .	. . .	15±	8
	"	10. 36.	N.	1	Bluish-white	. .	. . .	25	9
December	9	9. 36. 48	J.	3	Bluish-white	1	None	. .	10
	"	10. 20. 58	J.	3	Bluish-white	1	None	10	11
December	10	11. 5. 24	J.	3	Bluish-white	0·6	None	10	12
	"	11. 43. 13	J.	2	Bluish-white	1	None	15	13
	"	12. 12. 24	J.	2	Bluish-white	1	None	8	14
	"	12. 54. 40	J.	2	Bluish-white	1	None	10	15
	"	12. 59. 59	J.	3	Bluish-white	1·5	None	20	16

August 12 and 13. Sky unfavourable for observation on account of cloud.
At the time of the November (Leo radiant) meteors, the weather was very unfavourable.

No. for Reference.	Path of Meteor through the Stars.
1	Passed about 4° below Polaris, moving towards β Ursæ Minoris.
2	Passed across ε Ursæ Minoris and between ζ and ω Draconis.
3	From β Ursæ Minoris across η Ursæ Majoris.
4	From direction of α Cygni nearly across α Cephei (sky cloudy).
5	From 5° below ζ Ursæ Majoris to within 10° of γ Leonis. The diminution in the speed of the meteor as it approached the horizon was very marked.
6	From a point a few degrees to right of α Andromedæ passed a few degrees to left of α Pegasi.
7	Across Jupiter to a point 2° beyond γ Piscium.
8	From direction of δ Draconis moved nearly to δ Cygni.
9	From Draco passed a few degrees below κ Cygni to a point a few degrees above β Cygni.
10	From direction of γ Camelopardali disappeared midway between γ Cassiopeiæ and ψ Cassiopeiæ.
11	From between β and τ Cassiopeiæ disappeared near α Lacertæ.
12	Shot from θ Tauri and disappeared a little below ν Tauri.
13	Appeared a little below ζ Orionis and shot across ι Orionis.
14	Appeared midway between ζ Orionis and Sirius and passed between θ and η Leporis.
15	Shot from near β Aurigæ and disappeared a little below λ Aurigæ.
16	From θ Ursæ Majoris to near α Lyncis.

On 1880, August 10, the number of Meteors appearing between 9^h and 14^h was counted, with the following result:—

Periods of Observation, 1880, August 10.	Number of Meteors counted in each Period.	Number of Meteors in each Hour.
h m — h m		
From 9. 0 to 9. 15	6	18
9. 15 to 9. 30	7	
9. 30 to 9. 45	2	
9. 45 to 10. 0	3	
10. 0 to 10. 15	2	20
10. 15 to 10. 30	3	
10. 30 to 10. 45	8	
10. 45 to 11. 0	7	
11. 0 to 11. 15	8	31
11. 15 to 11. 30	14	
11. 30 to 11. 45	4	
11. 45 to 12. 0	5	
12. 0 to 12. 15	3	30
12. 15 to 12. 30	4	
12. 30 to 12. 45	10	
12. 45 to 13. 0	13	
13. 0 to 13. 15	8	30
13. 15 to 13. 30	4	
13. 30 to 13. 45	10	
13. 45 to 14. 0	8	
Total..........................		129

During the whole period (9^h to 14^h) the sky was generally free from cloud, but it was very misty at times. After 14^h the sky was quite covered with cloud.